OSA 5548C SSU-E60

USER MANUAL

for OSA SSU-E60

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What's new in this edition

- ❖ Update TL1 TCC-PTP command (release 1.57)
- ❖ Add TCC-PTP setting
- ❖ Add Unicast capability
- ❖ Add Input Line remark in chapter 6.5.3

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Chapter

1. Introduction

Including :

- ❖ About this Manual
- ❖ Reading Guide
- ❖ Safety
- ❖ Warranty
- ❖ Certification

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1.1 About this Manual

This manual has been designed to provide basic and detailed information for the correct use and operation of the OSA 5548C SSU. It summarizes the overall equipment concept and theory of operation, describes the hardware itself and provides information related to installation, operation and maintenance as well as a description of the TL1 commands available.

It is intended for the use of the following types of users:

- **Systems Engineers:** An overview of the equipment concept and theory of operation as well as an ordering guide is provided in Chapter 2.
- **Installation Engineers:** Detailed technical information and procedures for correct installation, operation, configuration and commissioning as well as equipment specifications and maintenance guidelines are provided in Chapters 3 through 9.
- **Maintenance Engineers:** Information on troubleshooting, maintenance and equipment technical data is provided in Chapters 6 through 9. The Appendices provide guidelines for analyzing alarms & events, a reference list for TL-1 commands and spare part ordering information.

1.1.1 Copyright Notice

1.2 Reading Guide

Special icons, attracting your attention, precede important and/or critical information in this document. Hereafter are explanations of each icon.

CAUTION

This symbol is extremely important and must not be neglected. It precedes information or procedures regarding installation, operation or maintenance. Follow all steps or procedures, as instructed, to avoid any damage to equipment or serious personal injury.

ELECTRICAL SHOCK HARZARD

This warning symbol is extremely important and must not be neglected. It indicates that there are dangerous high voltages present inside the enclosure of this product and precedes important warnings to avoid any risk of fire or electrical shock that could lead to serious personal injury or loss of life.

ESD CAUTION

Electrostatic Discharge (ESD) must be avoided so as not to damage or destroy static sensitive components.

***Note*:**

A note symbol informs the reader that additional information on the related subject is provided in order to simplify a described task, suggest other references or even just simplify an explanation.

Recommendation:

Recommendations advise the user on manufacturer tested methods and procedures proven valuable for correct use and optimum equipment results.

1.3 Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS.
DO NOT DISCARD, READ BEFORE OPERATING

GENERAL

Exercise extreme care when handling any electronics equipment as it contains precision parts that can be damaged by improper handling.

Avoid touching connector pin surfaces. Foreign matter deposited on contact surfaces can cause corrosion, and eventually lead to degradation of performance. In addition, do not use abrasives to clean contact/pin surfaces.

ESD CONSIDERATION

Each module contains semiconductor devices that can be damaged by electrostatic discharges. It is advisable to take anti-static precautions when handling electronic boards or static sensitive components. Use an approved anti-static bracelet in accordance with company practice.

WATER AND MOISTURE

Do not place containers with liquids such as coffee, water, sodas, etc. on this unit. Do not operate this equipment in a wet environment.

HEATING

Do not install this product near heat sources such as radiators, air ducts, areas subject to direct, intense sunlight, or other products that produce heat.

VENTILATION

Slots and openings in the chassis are provided for ventilation and to ensure reliable operation of the product. To protect the unit from overheating, those openings must not be blocked or covered. When integrating this unit in a rack cabinet, at least 1 RU (4.3 cm) of clearance above and below the unit is necessary to assure sufficient cooling.

GROUNDING

EARTH CONNECTION IS ESSENTIAL BEFORE CONNECTING TO THE SUPPLY.

Ensure that all devices connected to it are connected to its protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.)

Any interruption of the protective (grounding) conductor (inside the equipment) or disconnecting the protective earth terminal is likely to make this equipment dangerous. Intentional interruption is prohibited.

POWER

Make sure the power sources are compatible with the power inputs of the equipment. Verify that the correct fuses are installed. The equipment's protective earth terminals must be connected to the protective conductor of the (mains) power cord or the station earth. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding).

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Whenever it is likely that the protection offered by fuses has been impaired, the equipment must be made inoperative and be secured against any unintended operation

POWER CORD PROTECTION

The customer-supplied power cables connected to the 5548C should be routed or installed in such a manner to protect it from being walked on or pinched. The unit should be powered down completely before connecting or disconnecting the power cable. The power cord should be removed before moving the unit. The power cord must be placed near an easily accessible unobstructed socket outlet.

CLEANING

Connected and running equipment can only be dusted using a soft dry cloth.

ONLY WITH**, AUTHORIZED PERMISSION,** OUT OF SERVICE & UNPLUGGED equipment can be cleaned with a soft cloth slightly moistened with a mild detergent solution. Do not use liquid cleaners, aerosols, abrasive pads, scouring powders or solvents, such as benzine or alcohol. Ensure the surface cleaned is fully dry before reconnecting power

SERVICING AND MODIFICATIONS

To avoid dangerous electric shock, do not perform any servicing or modifications other than what is recommended in this User Manual. Do not attempt to gain access to areas of the unit where dangerous voltages are present. Refer servicing to qualified service personnel.

DAMAGE REQUIRING SERVICE

- Refer servicing to qualified service personnel under the following conditions:
- When the power supply cord is damaged.
- If liquid has been spilled into the enclosure of the unit.
- If the product does not function normally by following the instructions in the User's Manual. Adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage and will often require rework by a qualified technician to restore the product to its normal operation.
- If the product has been damaged in any way.
- When the unit displays a negative, distinct change in performance.

1.4 Warranty

This Oscilloquartz product carries a warranty which commences from date of dispatch from factory. Unless agreed otherwise or stipulated differently on the original acknowledgement of order, the duration of the warranty is twenty four months.

It applies to demonstrably faulty material or poor workmanship, but excludes batteries.

Oscilloquartz shall bear only the cost of repair or replacement in its own premises. Should this not be possible for reasons beyond our control, all additional costs are at customer expense.

Repairs under warranty carry either the balance of the original warranty or a six months warranty, whichever is longer.

Damages resulting from natural wear, improper maintenance, failure to observe the operating instructions, excessive strain, unsuited consumption material as well as improper environmental and mounting conditions are excluded from this warranty.

The warranty expires if the customer or a third party modifies or repairs the product without Oscilloquartz's prior written consent or if the customer does not take immediate steps to prevent the damage from becoming more serious; likewise, if insufficient time is provided for repair or replacement.

The customer will not be entitled to other warranty claims. Oscilloquartz is not liable for consequential damage.

1.5 Certification

EQUIPMENT CERTIFICATION:

Oscilloquartz equipment is tested according to well-defined procedures. Appropriate testing and inspection takes place at the component, board, equipment and system levels. The company maintains in-house cesium standards that are continuously compared to UTC. Before any equipment is released, it must satisfy the relevant tests and inspection schedules. The equipment is then issued with a "Certificate of Conformity" that guarantees its conformance with the relevant performance criteria.

The OSA 5548C SSU is designed to be compliant to:

- ITU-T
- ETSI
- EMC
- CE

A variety of Oscilloquartz products are certified world-wide. For details, please refer to our web site at www.oscilloquartz.com

COMPANY CERTIFICATION:

- Certified since 1987 by the Swiss Accreditation Service as an accredited laboratory for time and frequency.
- Certified ISO 9001 since 1994 and ISO 14001 since 2000 by The Swiss Association for Quality and Management Systems (SQS)

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Chapter

2. Product Overview

Including:

- Introduction
- Main Applications
- Main Functions
- System Description
- System Components & Operation
- Communication
- Synchronization Status Messaging (SSM)
- Alarms

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2.1 Introduction

The OSA 5548C Synchronization Supply Unit (SSU) is the latest product of a range of similar devices designed for Telecom Network Synchronization, complying with the highest standards. The unit incorporates the latest technological innovations and features for the most demanding present and future network requirements.

The OSA 5548C SSU is the most compact and high performance unit available on the market today for the synchronization of mobile and fixed telecommunication networks.

The OSA 5548C SSU is a timing/signal regenerator/distributor housed in a 3U or 6U subrack 19” or ETSI equipped with convenient front access plug in cards with optimized grouping of functionalities. All cards may be duplicated for full system redundancy from the inputs to the user outputs by simple insertion of a second adjacent card for 1:1 functionality protection. Duplicating the cards for full system redundancy does not impact on the maximum input or output capacity of the SSU (dedicated section for redundant modules). An additional security pass through function for extreme clock signal availability is also implemented, making the unit truly failure proof.

Insert one or both of the available integrated GPS modules to transform your SSU into a Primary Reference Source fully compliant to G.811 standards.

Several types of connectors are available on the main shelf or through a Remote panel with easy plug in connections. The equipment is locally accessible (RS-232) using an intuitive graphical user interface and remotely manageable (TCP/IP) via *SyncView PLUS*.

The OSA 5548C SSU has been designed on a truly flexible modular basis allowing multiple equipment configurations to meet all current and future synchronization requirements. By simple insertion of modules, the operator can upgrade any function of an initial configuration to a fully redundant one – upgrading does not require “powering off” of the unit and does not require additional module configuration (plug and play). The new inserted module will automatically be configured and software downloaded, no intervention needed from the operator. The same feature is used in case of capacity extension.

The OSA 5548C SSU fully supports the Synchronization Status Message (SSM) features from inputs decoding to outputs SSM distribution for true synchronization signals validation to collocated or downward network elements.

At a glance, some of the key features of the 5548C SSU, including a number of unique functions, are summarized below:

- Up to 8 inputs selectable on input cards
- Automatic input frequency validation
- Plug in single or dual GPS receiver card
- Universal input / output card design
- Innovative signal processing and distribution
- 20 user ports per card, software selectable per group of 10
- Up to 60 outputs protected 1:1 user selectable
- Modular connector tile sets for inputs / outputs
- Fully redundant architecture with 1:1 protection
- Pass through functionality
- Remote download of firmware and software release
- Compact 6U ETSI / 19" mountings
- Internal high stability Quartz crystal oscillator or Rubidium oscillator
- State-of-the-art DDS technology
- TL1 commands with SyncTerminal and easy graphical pull down menus
- Performance measurements on all inputs
- User selectable SSM decoding and encoding
- Auto detection of redundant card function and firmware version
- Firmware detection and upgrade upon redundant card insertion
- NGN ready for maximum flexibility
- Unique design for master or expansions shelves
- Upgrade for other interface options such as re-timing (RTU) and time-of-day distribution (NTP, PTP)
- Ports for the addition of Expansion Shelves for increased number of outputs

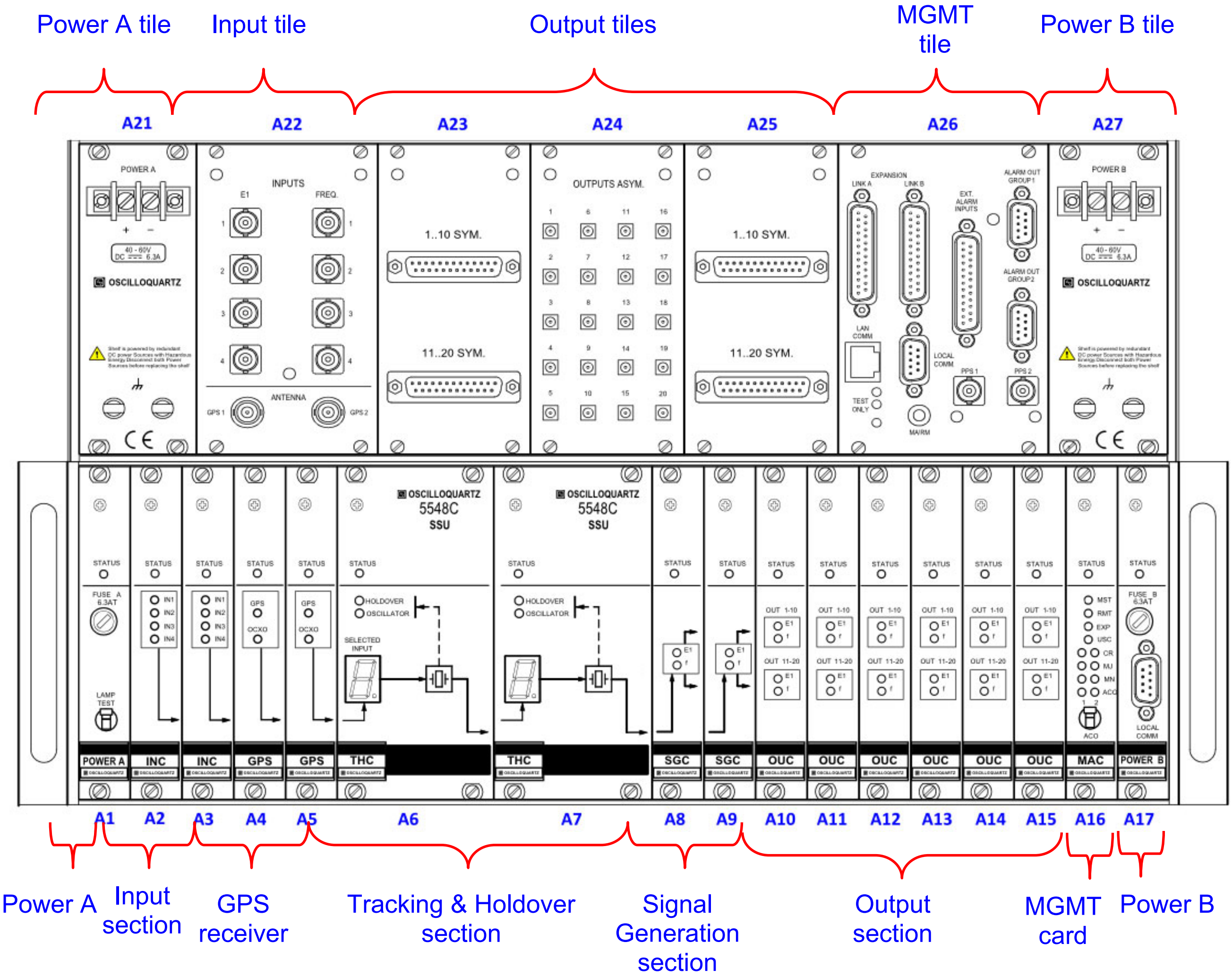


Figure 2-1 : 5548C SSU-E60 Front View - example

Note:

Your equipment can look different depending on the installed cards.

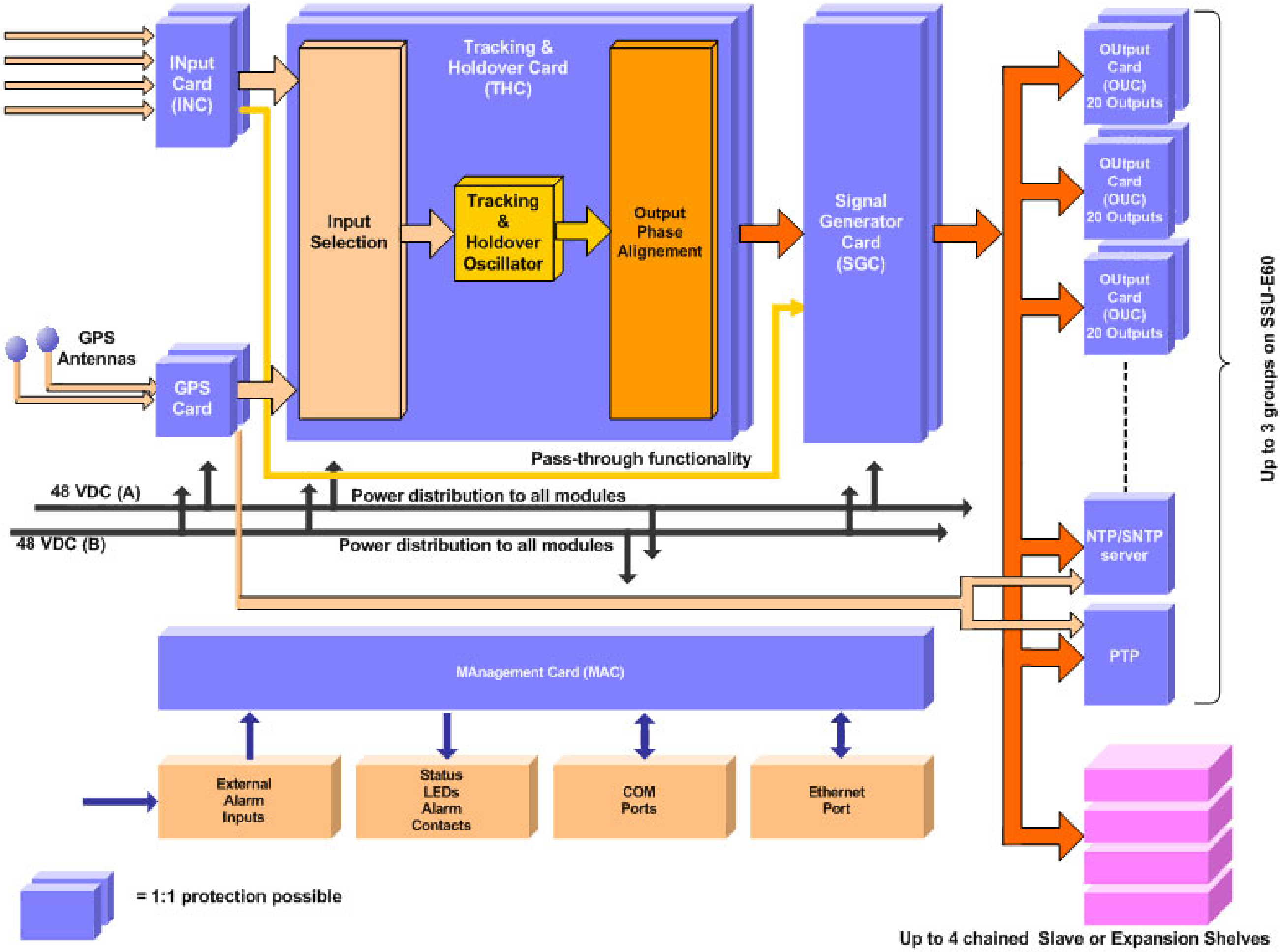


Figure 2-2 : 5548C SSU-E60 Simplified Block Diagram

The OSA 5548C is locally (RS-232) and remotely (TCP/IP) manageable.

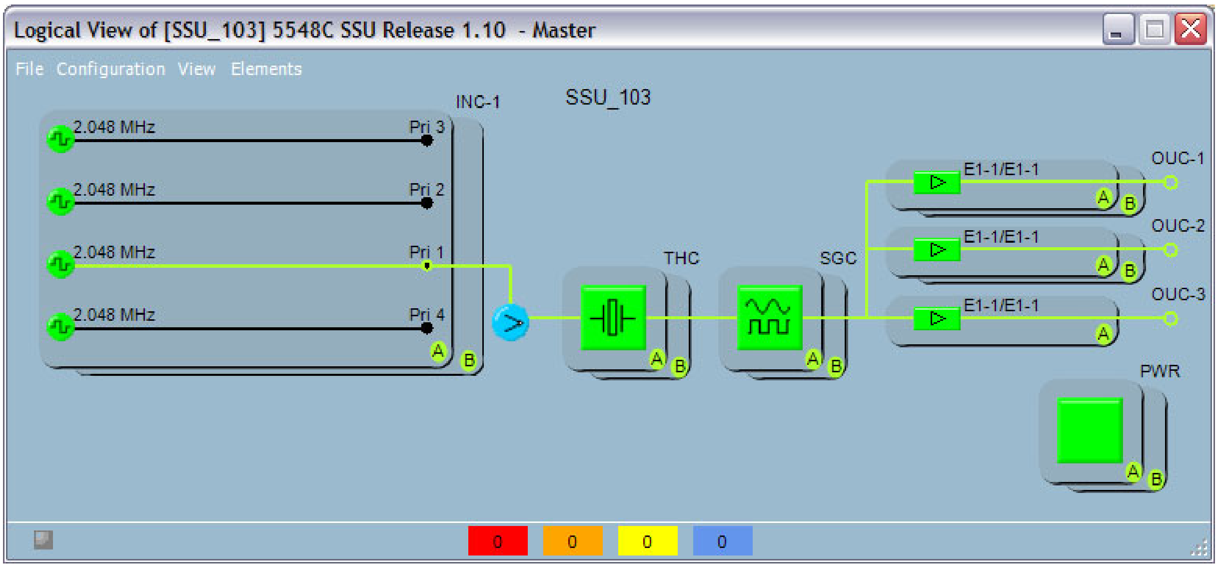


Figure 2-3 : Logical View of *SyncView PLUS*

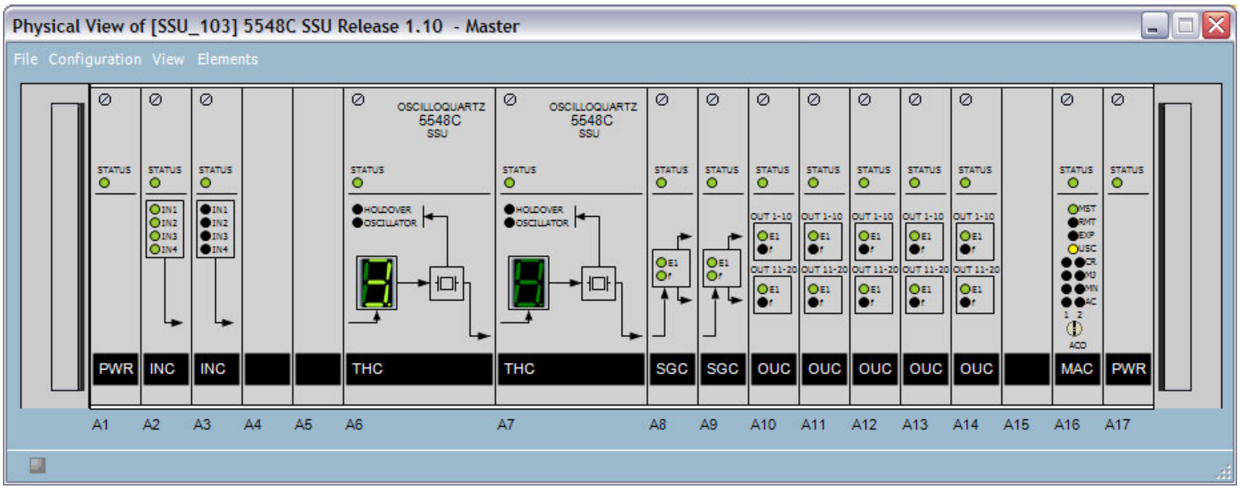


Figure 2-4 : Physical View of *SyncView PLUS*

2.2 Main Applications

2.2.1 Synchronous Network Technologies Requiring Synchronization

2.2.1.1 Telephony Exchanges

The switching of 64 kbit/s circuits in digital telephony exchanges requires strict synchronism between the processed signals. Some limited amount of wander (usually at least 18 microseconds) can be absorbed by the buffer stores on the input ports. Too much wander (relative to the equipment clock) will cause the buffer stores to over- or underflow, ending in loss or duplication of 125 microseconds worth of data (one frame on an 2048 kbit/s signal or one octet on a 64 kbit/s signal). This is called a controlled slip. ITU-T Rec. G.822 specifies upper limits for slip rates.

In order to maintain the operation of the network within these slip-rate limits, the wander on 2048 kbit/s traffic signals must be kept below the so-called Network Limits, as specified in the new ITU-T Rec. G.823. This is achieved by two measures. First, all exchanges in a network are synchronized to a Primary Reference Clock (PRC). Secondly, SSUs are deployed in exchange nodes in order to minimize the detrimental effects of loosing traceability to the PRC due to link or equipment failures. An SSU which looses all PRC-traceable reference input signals goes into holdover mode. An SSU in holdover mode is capable of delivering a synchronization signal of near PRC quality for a few days.

2.2.1.2 SDH Network Elements

The quality of synchronization for SDH network elements has a direct influence on the wander introduced to 2048 kbit/s traffic signals (E1) that are transported over the SDH network. VC-12 pointer adjustments create wander on the E1 signals. This wander becomes apparent when the E1 signals are demultiplexed or dropped from the SDH signal. In order to limit this effect, the maximum acceptable wander for SDH signals and for signals synchronising SDH network elements must not exceed so-called Network Limits as specified by ITU-T Recommendations G.825 and G.823. A set of network planning rules must be followed in order be within the Network Limits, in particular three rules about clock chains (G.803).

The first rule says that the synchronization signal should be regenerated by the insertion of SSUs in the chain of clocks. There should never be more that 20 SDH Equipment clocks (SEC) between two SSUs or between the PRC and the first SSU. In practice operators tend to insert one SSU every 10 to 15 SECs, in order to have some margin in case the network grows.

The second rule says that there should not be more than 60 SECs in the entire synchronization chain. The third and last rule says that there should not be more than 10 SSUs in the chain.

2.2.1.3 ATM Switches

Despite its asynchronous switching technique, ATM switches need to properly time their physical layer signals. The synchronization quality required by ATM network elements depends on the specifications for their physical layer signals. The three most widely used physical layer signals in ATM are the so-called « SDH-based physical layer ATM signals » at the rates 51.84 Mbit/s, 155.52 Mbit/s, and 622.08 Mbit/s. Their timing characteristics are specified in ITU-T Recommendations I.432.2 and I.432.3. These specifications require data rate accuracies of 1E-11 under normal operating conditions and 20E-6 under failure conditions. This means that ATM network elements must take synchronization from a PRC complying with ITU-T Rec. G.811. Moreover, jitter and wander of these ATM signals must comply with the Network Limits of ITU-T Rec. G.825. In other words: ATM network elements with interfaces at 51.84 Mbit/s, 155.52 Mbit/s and 622.08 Mbit/s (« SDH-based ») require the same type of synchronization as SDH.

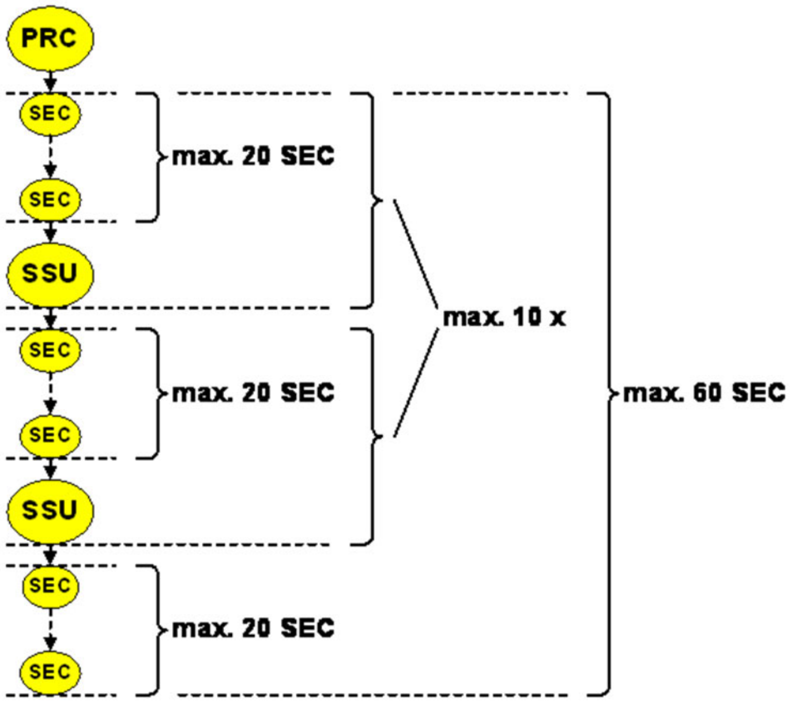


Figure 2-5 : Synchronization reference chain for SDH (ITU-T Rec. G.803)

2.2.1.4 DWDM Networks

The DWDM network technology standardized by the ITU-T, also known as "Optical Transport Network (OTN)" is based on a plesiochronous physical layer using a number of different wavelengths as transport channels. The OTN is a flexible transport technology which allows many different types of client traffic signals to be transported wavelength channels. A critical case is the transportation of SDH client signals. SDH being based on synchronous STM-N signals, the OTN network must provide reasonable timing transparency for the transported client signal. Since perfect timing transparency is not achievable, the residual timing degradations (jitter & wander) introduced by the OTN network must be taken care of in the SDH layer. ITU-T Rec. 8251 contains guidelines in the form of a "Synchronization Reference Chain". According to this model, the SDH timing must be regenerated by an SSU each time the SDH client signal leaves the OTN layer. Furthermore, each OTN island or OTN hop must not contain more than 10 OTN network elements, and the number of SSUs introduced to fulfil the first rule is limited to a maximum of 10.

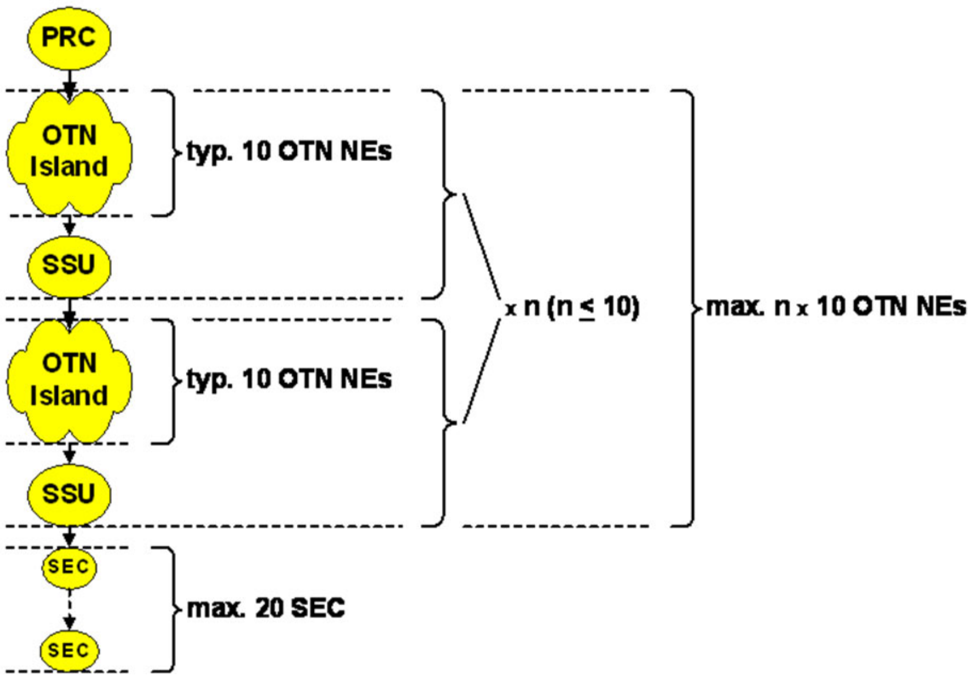


Figure 2-6 : Synchronization reference chain for SDH over OTN (ITU-T Rec. G.8251)

2.2.1.5 Mobile Networks

GSM and UMTS networks consist of a Radio Access Network and a Core Network. The Core Network consists mainly of switches and routers dedicated to mobile traffic called Mobile Switching Centers (MSC) and Serving GPRS Service Nodes (SGSN) respectively. Base Stations are connected to the MSCs and SGSNs via another type of network element called Base Station Controller (BSC) in GSM and Radio Network Controller (RNC) in UMTS. MSC, SGSN, BSC and RNS have exactly the same synchronization needs as ordinary digital telephony switches (see above). This means that their synchronization must be traceable to a PRC compliant with ITU-T Rec. G.811. Sites containing any of these types of network elements are equipped with SSUs in order to provide holdover protection in case of failures causing the loss of PRC-traceability.

2.2.1.6 Next Generation Networks

In Next Generation Networks (NGN) traffic generated by all service types consist of IP packets or, less frequently, ATM cells. IP routers forward IP packets asynchronously. Nevertheless, large IP routers usually feature, among other port types, synchronous SDH and SONET ports. This means that packets are routed asynchronously and then transported over synchronous physical layer signals. Multi-Service Provisioning Platforms or MSPPs interconnect both synchronous and asynchronous networks by providing both synchronous ports such as E1 and STM-n, as well as asynchronous ports such as Ethernet. In all cases where NGN network elements have synchronous ports, synchronization of the same quality as in SDH and SONET networks is required. SSUs are used in order to obtain this synchronization quality and in order to provide holdover protection. In NGN the need for the distribution of Time-of-Day (TOD) information is also increasing. This required GPS-based TOD servers. SSUs with internal GPS receiver functions can be used for this purpose.

2.2.2 Synchronization Distribution Methods

The OSA 5548C SSU is normally used as a node clock: it is the central clock of a telecom building or site, it distributes synchronization to all synchronization-consuming equipment in the building. The SSU therefore has a clock function and a signal distribution function (i.e. many output ports). The SSUs clock function needs to be locked to some PRC source such a s an atomic Cesium clock or a GPS-receiver. This section explains how PRC-traceable synchronization reference signals are supplied to the input ports of the SSU.

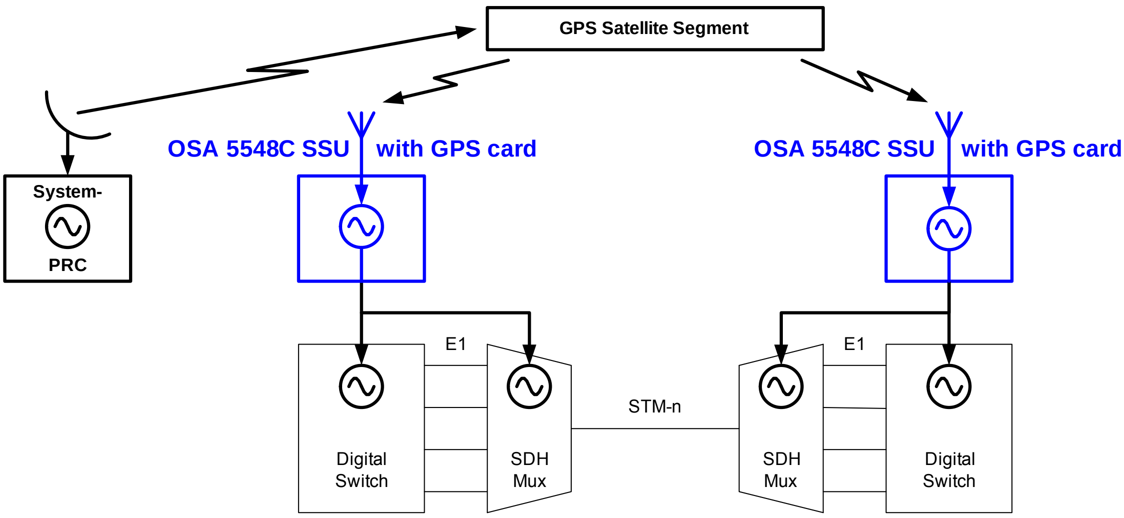


Figure 2-7 : GPS

The simplest solution is to incorporate a GPS receiver card into the OSA 5548C SSU. This is illustrated in Figure 2-7. The figure shows how the GPS satellite segment conveys time and synchronization information from the distant GPS System PRC to the GPS receiver card, where the information is decoded. The OSA 5548C SSU equipped with a GPS receiver card now acts as a virtual network PRC in the sense of ITU-T Recommendation G.811. Often, however, telecommunication networks have their own physical PRC system, and synchronization reference signals must be transported from the PRC to all SSUs in the network. This is done via a sometimes complex synchronization distribution network. Figure 2-8 to Figure 2-10 illustrate the transport mechanisms that are used. Figure 2-8 shows the case of SDH and SONET. Here the aggregate STM-n (or OC-n) signal acts as the synchronization carrier. In the SSU site the SDH network element extracts the synchronization from the STM-s signal and redirects it to the SSU.

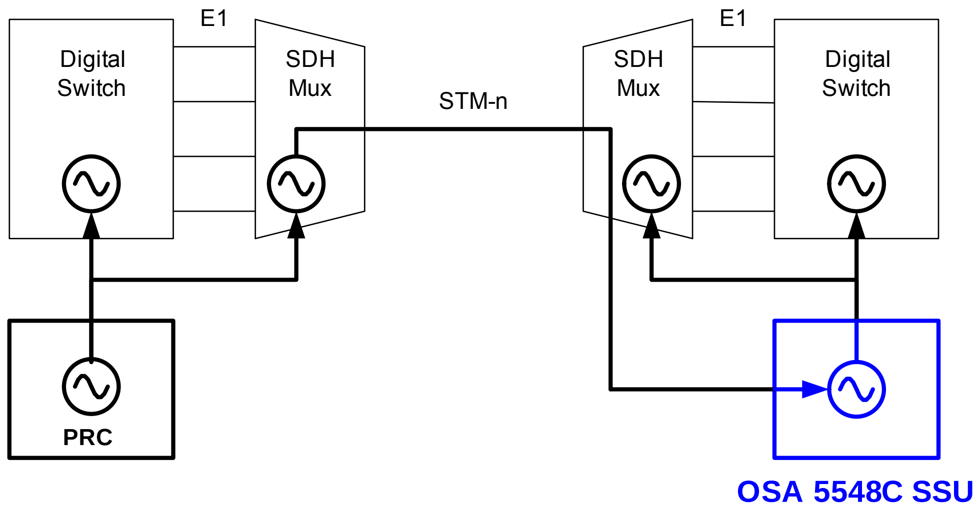


Figure 2-8 : Synchronization transfer in SDH & SONET

In PDH things are quite different, as can be seen in Figure 2-9. Since in PDH signal mapping and demapping are perfectly transparent for the timing of the tributary signals, E1 tributaries originating in a synchronous network element are used to transport synchronization to the other end. There a passive timing extractor redirects a small part of the signal power to the SSU.

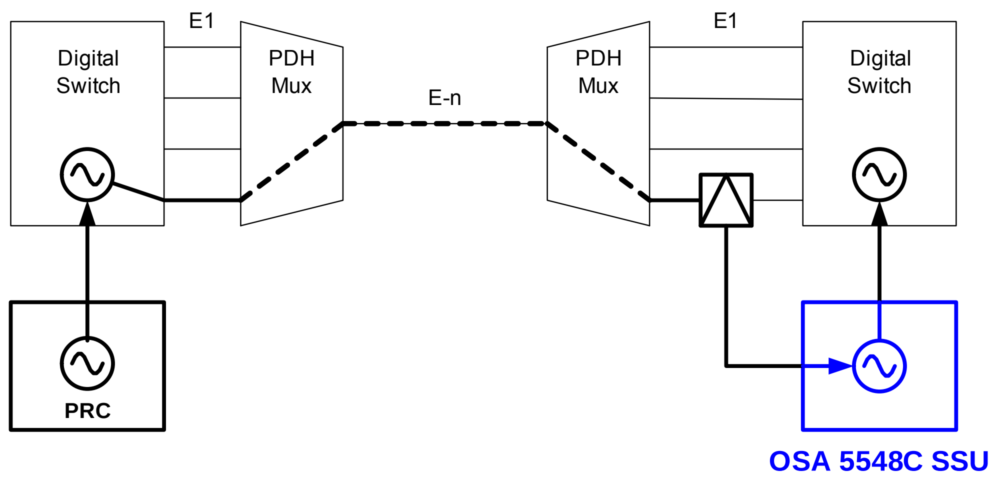


Figure 2-9 : Synchronization transfer in PDH

Figure 2-10 shows the case of SDH/SONET over WDM (DWDM or CWDM). WDM networks are more or less transparent for the timing of the STM-n or OC-n signals. Therefore it is possible to use the STM-n (or OC-n) signals as synchronization carriers. The SSU's inputs are connected to the SDH/SONET network element exactly like in the pure SDH/SONET case.

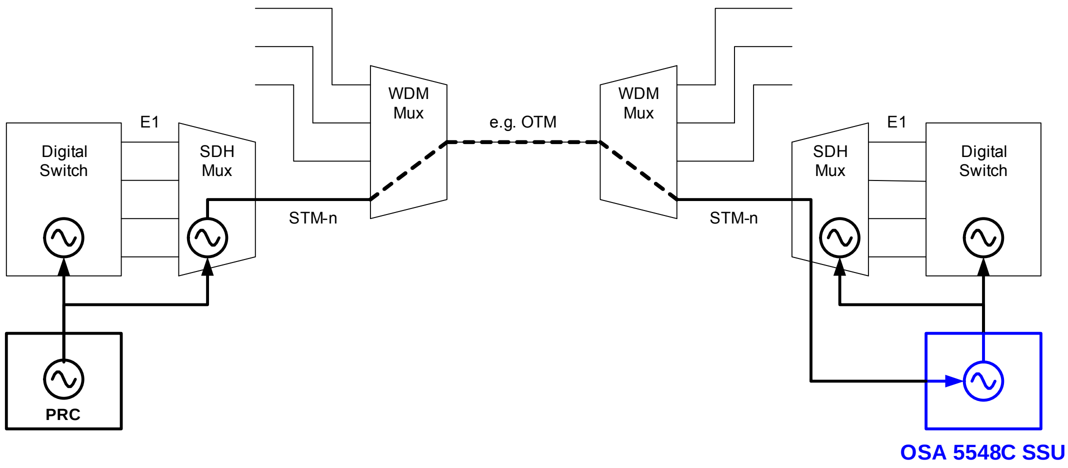


Figure 2-10 : Synchronization transfer in WDM

2.2.3 Use Cases

2.2.3.1 The 5548C as a Primary Reference Clock

The OSA 5548C SSU can be used as a Primary Reference Clock (PRC) in several ways. The first way is to equip the 5548C with one or two GPS cards, as shown in Figure 2-11. The second GPS card is optional and serves to improve reliability. With this configuration the 5548C is a self-contained PRC which complies with ITU-T Recommendation G.811 when locked to GPS.

Figure 2-11 : The 5548C with internal GPS cards

Figure 2-12 shows a second possibility. Here the PRC system consists of an external PRC source, typically an atomic Cesium clock and an OSA 5548C SSU possibly with a GPS card. Other combinations are also possible, e.g. two external Cesium clocks and two internal GPS cards, or an external Cesium clock and an external GPS receivers, etc.

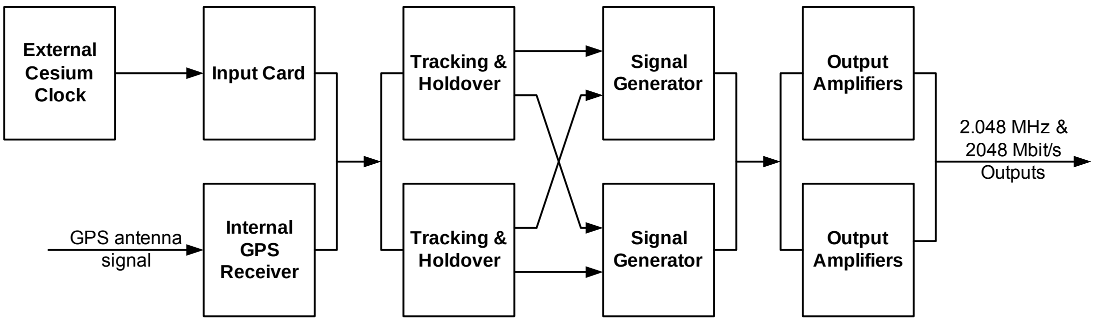


Figure 2-12 : The 5548C with an external Cesium clock

2.2.3.2 The 5548C as a Synchronization Supply Unit

The OSA 5548 SSU configured as shown in Figure 2-13 functions as a true Synchronization Supply Unit in the sense of and compliant with ITU-T Recommendation G.812. The SSU terminates up to eight synchronization input signals and selects one of them as the active reference. The internal oscillator is normally phase-locked to the active reference. The Phase Locked Loop removes jitter and wander from the signal and fans out the cleaned up signal to up to 60 output ports. If all input signals are lost, the SSU enters holdover mode and maintains synchronization output signals which are of adequate quality for a limited period of time.

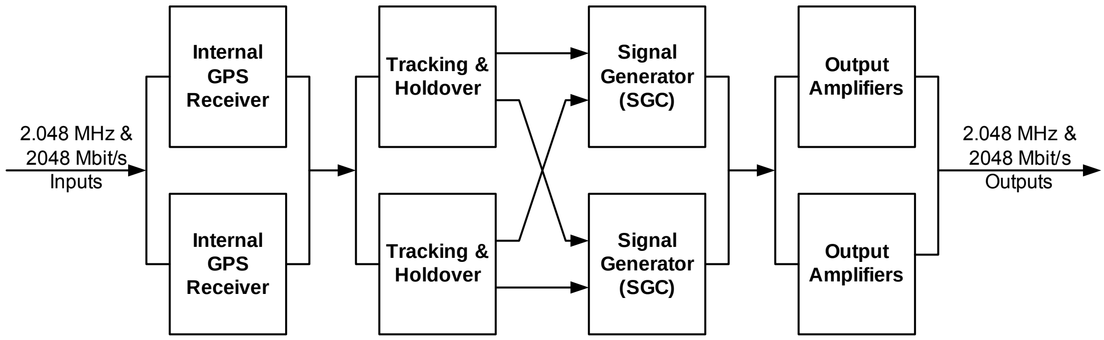


Figure 2-13 : The 5548C as Synchronization Supply Unit

2.2.3.3 The 5548C as an SSU Expansion Shelf

Figure 2-14 shows the OSA 5548C SSU configured as an Expansion Shelf. The Tracking & Holdover function is missing since Expansion Shelves are used to increase the number of output ports of another 5548C used as an SSU or a PRC. Up to 4 Expansion Shelves can be connected to the main 5548C by redundant link cables as shown in Figure 2-15. The Expansion Shelves are managed through the main 5548C via a management bus contained in the link cables. The maximum distance between the main 5548C and the last Expansion Shelf is 30 m. This maximum distance remains applicable when only one Expansion Shelf is connected.

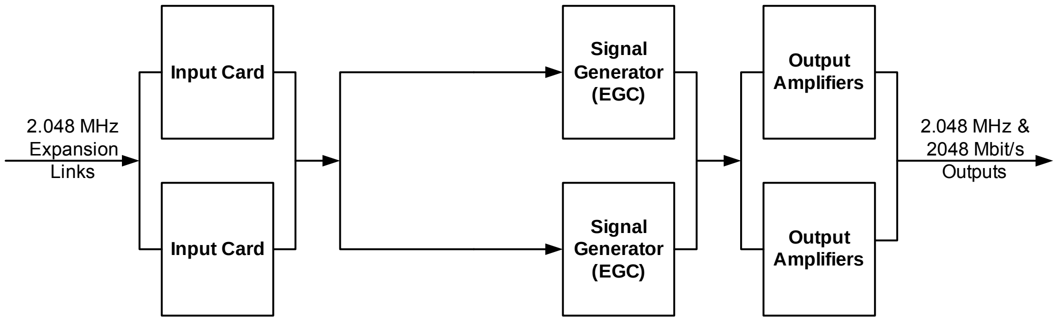


Figure 2-14 : The 5548C configured as an Expansion Shelf

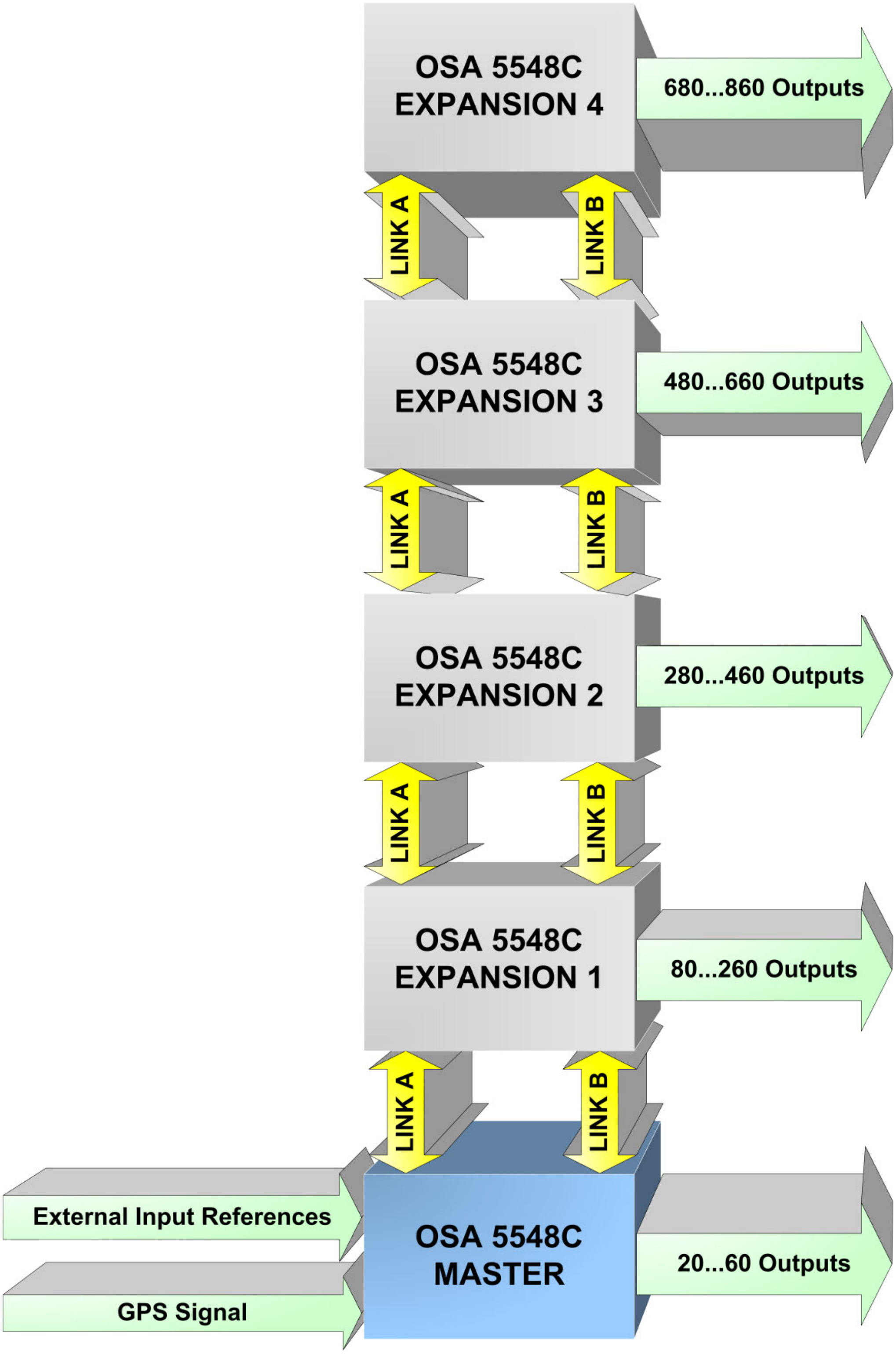


Figure 2-15 : The 5548C as an SSU Expansion Shelf

2.2.3.4 The 5548C as a Time-of-Day Server

An OSA 5548C SSU equipped with internal GPS cards and with a Time-of-Day card can be used as a Time-of-Day (TOD) server (see Figure 2-16). Time-of-Day information comes in different formats, depending on the TOD card type. Popular TOD protocols are NTP (RFC 1305) and PTP (IEEE 1588). TOD cards are future product options. Please consult factory for information about availability.

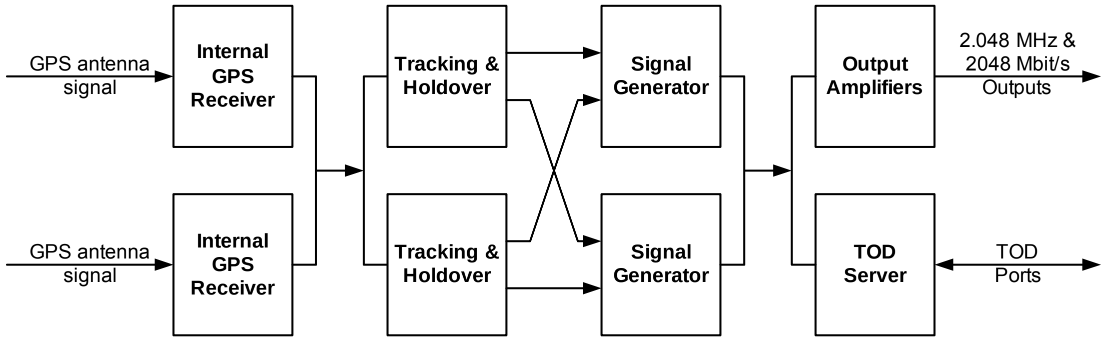


Figure 2-16 : The 5548C as a Time-of-Day (TOD) server

2.3 Main Functions

The OSCILLOQUARTZ 5548C **S**ynchronization **S**upply **U**nit (SSU) equipment is a timing/signal distributor. It resides in an ETSI subrack with various connectors. Depending on its configuration it can be composed as a single channel or as fully redundant unit. The equipment is locally (RS-232) and remotely (TCP/IP) manageable.

2.3.1 Input reference Selection

The OSA 5548C SSU selects one of the input reference signals among up to 4 available input lines (IL), which can be assigned by software commands on any of the 8 input connectors (4x E1 and 4x Frequency).

Selection is based on:

- User defined priority table
- Input signal alarms detection
- Input signal performance measurements
- Synchronization Status Message (SSM)

2.3.2 Jitter Attenuation

The selected input reference signal may be affected by phase variations known as jitter. The OSA 5548C SSU can filter this jitter by tracking the internal oscillators on the selected input, and distributing 2.048 Mbit/s (E1) a 2.048 MHz signals with a reduced level of jitter.

2.3.3 Holdover/Freerun mode

When all input references are unavailable, the OSA 5548C SSU generates output signals based on the high quality internal oscillator.
The end-user can select the appropriate type of oscillator:

- Rubidium oscillator for enhanced SSU Type II holdover performance characteristic
- OSA 8663 quartz oscillator for SSU-A (Type I et V) holdover performance characteristics

2.3.4 Signal Distribution

The OSA 5548C SSU equipment distributes up to 60 synchronization signals. The 3 Output Card groups generate 2.048 Mbit/s (E1) or 2.048MHz.
Depending on the configuration, output signals are unprotected or protected. In the protected mode, each output signal is generated by two independent cards (one for one protection).

2.3.5 Pass-through

In case of failure or extraction of internal oscillators (THC cards), the equipment will automatically activate its “pass-through” (Clock bypass) function when at least one input signal 2.048MHz, E1 or GPS is connected and qualified.

It is an autonomous option of 'last-resort' in SSU input selection upon critical internal failure to prevent prolonged outage.

The selected input signal is directly connected to the Signal Generator Cards (SGC) allowing all Output Cards to generate synchronization signals.

The output signal quality will be, in this “pass-through” operating mode, the same as the selected input signal (no filtering and jitter attenuation).

***Note*:**

Upon switching to the pass-through mode, the output signal can be affected with a phase jump as the THC will not be there to filter and insure phase alignment.

***Note*:**

For more details and configuration, refer to section 6.8.6

2.3.6 Performance Measurement

The OSA 5548C SSU monitors, measures and calculates performances in Ym (fractional frequency), TDEV (Time DEViation) and MTIE (Maximum Time Interval Error) of every single input signal connected to its inputs, as well as the GPS input line.

The measurement is performed in the INC cards, which compare the input signal against a reliable frequency reference produced by the signal filtered and processed by the active THC card.

The performance measurement is processed when the input line meets one of the following criteria:

- Enabled: the line is activated to select an input reference.
- Monitored: the input line is only measured in order to assess the signal.

The user can also define a performance threshold to disqualify and reject input signals that fail to meet this programmable threshold.

2.3.7 Redundancy

Each individual card can be protected, one for one, by inserting an adjacent protection card, except for the Management Card.

The insertion of protection card does not require any type of configuration. The newly inserted card will automatically get the configuration of the card already inserted in the same group.

2.3.8 Firmware Download

The OSA 5548C SSU incorporates a FTP (File Transfer Protocol) client which allows upgrading every single card remotely.

When a card firmware is different than the whole shelf release, the system automatically informs the user. Then the user can easily upgrade the card in question in two clicks, via the management software.

Thus, the OSA 5548C SSU always insures that all cards firmware matches together and provide easy and comfortable release management.

2.3.9 TL1 Protocol

The OSA 5548C SSU uses the TL1 (Transaction Language 1) protocol to communicate. TL1 was defined in the 80's by Bellcore (now Telcordia) and is the dominant management protocol for controlling telecommunications networks in North America, China and other parts of the world.

The TL1 protocol consists of a set of ASCII messages or instructions that a terminal emulator, the ***SyncTerminal*** and the ***SyncView PLUS*** use to handle the OSA 5548C SSU functions.

2.4 System Description

2.4.1 Introduction

The OSA 5548C SSU is divided in different systems:

- The input signals qualification. Part A, B, C and D.
- The signal reference selection, tracking, filtering and holdover capability. Part E.
- The signal generation. Part F.
- The output signal amplification and distribution. Part G and H.
- The power distribution. Part I.
- The communication and alarm management. Part J.

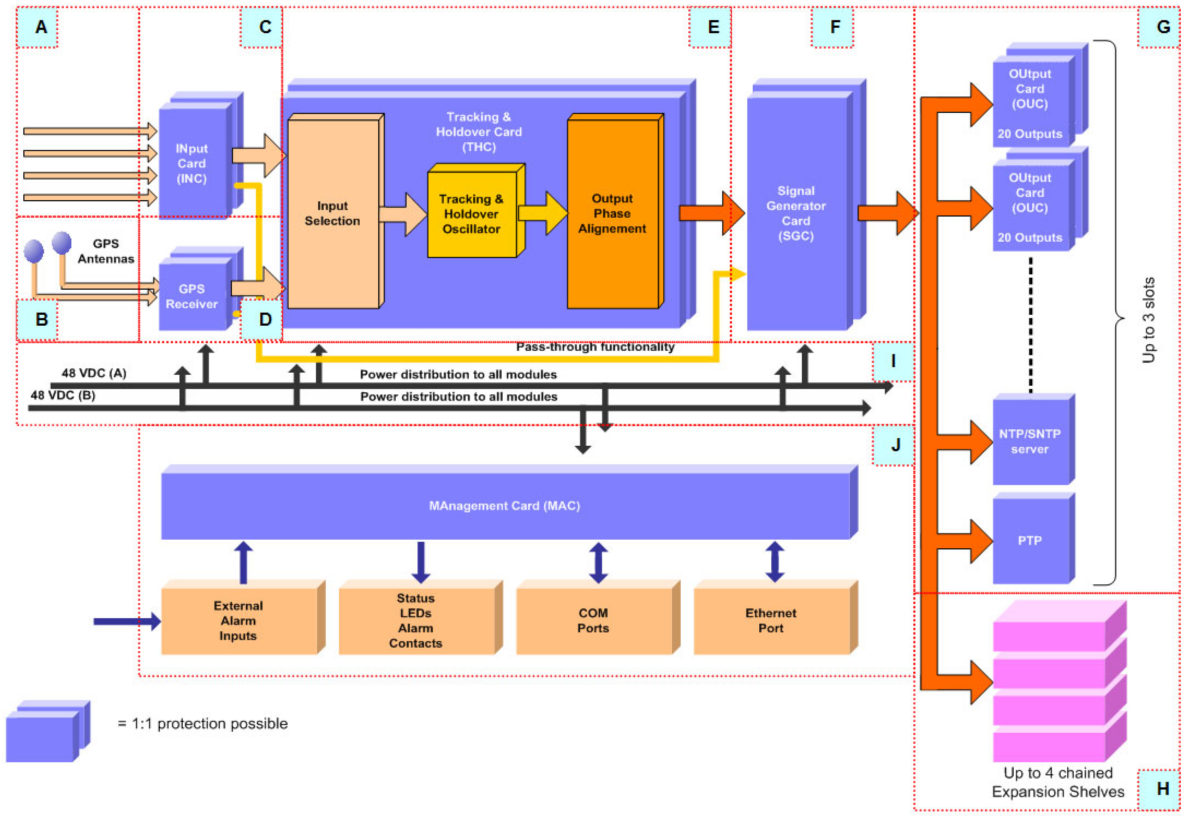


Figure 2-17 : System Description Diagram

2.4.2 *A:* Input Lines (IL)

The IL is the link between input connectors and INput Cards (INC) and Tracking & Holdover Cards (THC).
A total of 4 IL can be assigned by software command to the 8 available input connectors.

- 4x BNC connectors for asymmetrical E1, input references. A 120/75 ohms converter (Balun) can be installed for the symmetrical option.
- 4x BNC connectors for asymmetrical Frequency 2.048, 5 and 10 MHz input references. A 120/75 ohms converter (Balun) can be installed for the symmetrical option.

2.4.3 *C:* INput Cards (INC)

The 5548C SSU-E60 can be equipped with a group of up to 2 INC cards. The INC group can be protected when the second card is inserted in the adjacent slot.

INC group allow introducing up to 4 input references in the OSA 5548C SSU.

Depending on user configuration, the input signals can be:

- 2.048 Mbit/s (E1)
- 2.048 MHz, 5 MHz or 10 MHz

The INC cards condition and qualify the input references (Input Lines). They are also able to make phase measurement between the input signal and Tracking & Holdover Cards (THC) output signal to provide Maximum Time Interval Error (MTIE), Time DEViation (TDEV) and Fractional Frequency Deviation (Ym).

2.4.4 *B:* GPS Inputs

There are 2 GPS inputs connectors to connect two GPS antennas to the 5548C. These GPS inputs make the 5548C to get 2 redundant PRS quality references when GPS cards are locked. The GPS inputs are considered by the system as a single IL such as described in section *A:* Input Lines

2.4.5 *D:* GPS cards (GPS)

1 or 2 redundant GPS cards can be installed to condition and qualify the GPS signal coming through the GPS Inputs.

2.4.6 *D:* GNSS cards (GPS/GLONASS)

1 or 2 redundant GNSS cards can be installed to condition and qualify the GNSS signal coming through the GNSS Inputs.

2.4.7 *E:* Tracking & Holdover Cards (THC)

The THC can be protected by inserting the protection card in the adjacent slot. In case that all OSA 5548C SSU input signals are missing or in failure, the THC will continue to generate a frequency based on the internal oscillator operating in holdover mode.

Two THC types are available:

- With internal Rubidium Oscillator for SSU Type 2 holdover capability
- With internal Oven Controlled Oscillator (OCXO) for SSU Type I & V holdover capability

These above THC types can be mixed together.

This card selects one of the input reference signals according to different configurable criteria to track the local high performance oscillator in order to filter and attenuate the phase-time jitter, such as:

- User defined priority table
- Input signal alarms detection
- Input signal performance measurements
- Synchronization Status Message (SSM)

The THC output signal is forwarded to the Signal Generator Card and consequently to the Output Card in order to distribute precise synchronization signals to all network elements connected to the OSA 5548C SSU unit.

When both THC are removed or in alarm condition, the 5548C enters in pass-through operation mode.

2.4.8 *F:* Signal Generator Cards (SGC)

SGC card processes the reference signal from the Tracking Holdover Card (THC) and delivers 2.048MHz, PPS and E1 signals to all of the output cards, expansion shelves and PPS outputs. The SGC should be protected by the introduction of a second card in the adjacent slot.

2.4.9 *G:* OUtput Section

The OSA 5548C can distribute different type of Time & Frequency Services from its OUC slots, such as below:

- E1, 2.048MHz
- NTP
- TCC-PTP
- E1 retiming

2.4.9.1 OUtput Card (OUC)

The OSA 5548C can be configured with up to 3 OUC groups. Each one distributes twenty output signal references. Each card can be protected by the insertion of a redundant card, for a maximum of 60 output signals (Protected or Unprotected).
The output connector tile provides 20 output ports divided in 2 groups of 10 outputs, which can be configured in:

- 2.048MHz according to ITU-T G.703.13
- E1 configuration nr.1 according to ITU-T G.703.9
- E1 configuration nr.2 according to ITU-T G.703.9

The E1 configuration nr.1 and nr.2 are customizable by software and allow the user to:

- select the code type (HDB3 or AMI)
- enable CRC-4
- configure the Time Slot 16 (TS16) structure (CCS, CAS)
- configure Sa bits
- configure the Idle

The OSA 5548C has also the capability to show a SHORTED alarm when it detects short circuit on any of an OUC’s Output Lines.
The user can insert one or two OUC cards in each of the OUC groups depending on protection requirements.

2.4.9.2 Time Code Card - NTP (TCC-NTP)

The TCC-NTP card is a NTP server (RFC1305) which provides a reliable and easy synchronization of Ethernet TCP/IP network.
A TCC-NTP card can be inserted in any of the OUC group, which makes therefore the OSA 5548C SSU able to provide up to 3 NTP ports.
Its own base time and its algorithm guarantee a high level accuracy when the GPS card is tracked.
High security level: 64 bits RSA™ MD5 encryption, leap time protection, high stability time base.
The OSA 5548C SSU offers the following possibilities of TCC-NTP card management:

- from the 5548C management system while blocking access from individual NTP port

The TCC-NTP has autonomy to provide a stable output time code even when external synchronization is lost by using the THC cards as clock reference.

2.4.9.3 Time Code Card - PTP (TCC-PTP)

The TCC-PTP card is a PTP server (IEEE-1588) which provides a reliable and easy synchronization of Ethernet and TCP/IP networks.

The TCC-PTP card is a PTP master. The card provides through the Ethernet connector (SFP) short time messages to slaves (typically 8 to 64 per second). Packets may be Sync, Follow-up, Delay request and Delay response as specified by IEEE-1588v2. Accurate measurement and time stamping of these messages allow slaves to recover the master clock with a nanosecond resolution.

TCC-PTP cards can be inserted in any OUC slot, which therefore allows the OSA 5548C SSU E60 to host up to 6 PTP ports.
When the 5548C GPS card is tracked, the PTP master can provide time information with +/-50ns. Furthermore, the 5548C holdover capabilities, assured by the THC module, make possible achieving a comparable level of accuracy when the GPS card switches into unlocked state.

In the 5548C, the TCC-PTP cards are managed indirectly through the MAC module.

.

Note:

The IEEE 1588 v2 standard defines protocol and methods to synchronize systems over packet networks. For more information concerning the IEEE norms, please visit: http://standards.ieee.org/

2.4.10 *H:* Expansion Shelves*

Expansion Shelves are required when it is necessary to get more than 60 outputs. An expansion can allow up to 60 or 200 additional outputs. Up to 4 expansion shelves can be connected to the main shelf with redundant links making the 5548C providing up to 860 output ports.

*: Contact Oscilloquartz for availability

2.4.11 *I:* Power Supply

The OSA 5548C is equipped with two DC power supply inputs. Each OSA 5548C SSU card includes its own power supply converter connected to both power supply inputs. The power supply voltage range is: 40 Vdc to 60 Vdc.

2.4.12 *J:* MAnagament Cards (MAC)

The MAC gathers and reports all alarms and events from all cards, in addition to external alarm inputs. The MAC is the communication interface for local and remote management, allowing an operator to access information, via local serial ports (RS-232) and/or the remote Ethernet (TCP/IP) interfaces.

2.5 System Components & Operation

2.5.1 Overview

The OSCILLOQUARTZ 5548C Synchronization Supply Unit (SSU) has been developed on a modular basis (plug-in cards) allowing the operator to upgrade the configuration of the equipment without normal operation interruption. Each individual function can be equipped as single or dual card to introduce redundancy and protection.

As well as the cards, the connector tiles are field replaceable and do not require a power cycle of the equipment.

A group of cards is always composed with an “A” card, usually the left one and an optional “B” card, usually the right one. When no card is inserted in a slot, a blank panel is required and the slot must be deactivated by software management interface.

In the INC, GPS and THC groups one of the two cards is active and the second is in stand-by to protect the active one. In the SGC, OUC and POWER groups, both cards are active. MAC, NTP and PTP cards cannot be protected.

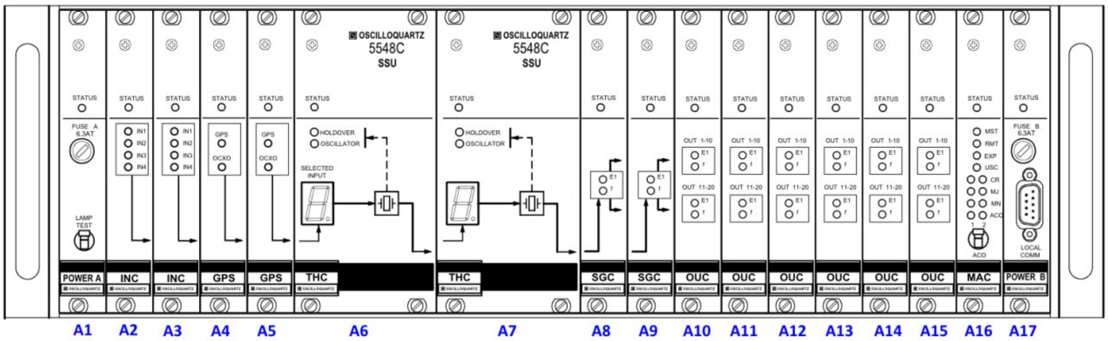


Figure 2-18 : 5548C SSU-E60 Front Panel Layout

Slot	Card name	Type*	Abbrev.	Group
A1	Power A	A	PWR A	PWR
A2	INput Card	A	INC	INC 1
A3	INput Card	B	INC	
A4	GPS	A	GPS	GPS
A5	GPS	B	GPS	
A6	Tracking & Holdover Card	A	THC	THC
A7	Tracking & Holdover Card	B	THC	
A8	Signal Generator Card	A	SGC	SGC
A9	Signal Generator Card	B	SGC	
A10	OUtput Card, TCC-NTP card,TCC-PTP card	A	OUC, NTP,PTP	OUC 1, NTP 1, PTP 1
A11	OUtput Card	B	OUC	
A12	OUtput Card, TCC-NTP card,TCC-PTP card	A	OUC, NTP, PTP,	OUC 2, NTP 2, PTP 2
A13	OUtput Card	B	OUC	
A14	OUtput Card, TCC-NTP card,TCC-PTP card	A	OUC, NTP, PTP,	OUC 3, NTP 3, PTP
A15	OUtput Card	B	OUC	
A16	MAnagement Card	A	MAC	MAC
A17	Power B	B	PWR B	PWR

*__A__: Master card & __B__: Slave card (protection card)
Table 2-1 Card Locations

2.5.2 Card Description

The overall physical layout is similar for all cards:

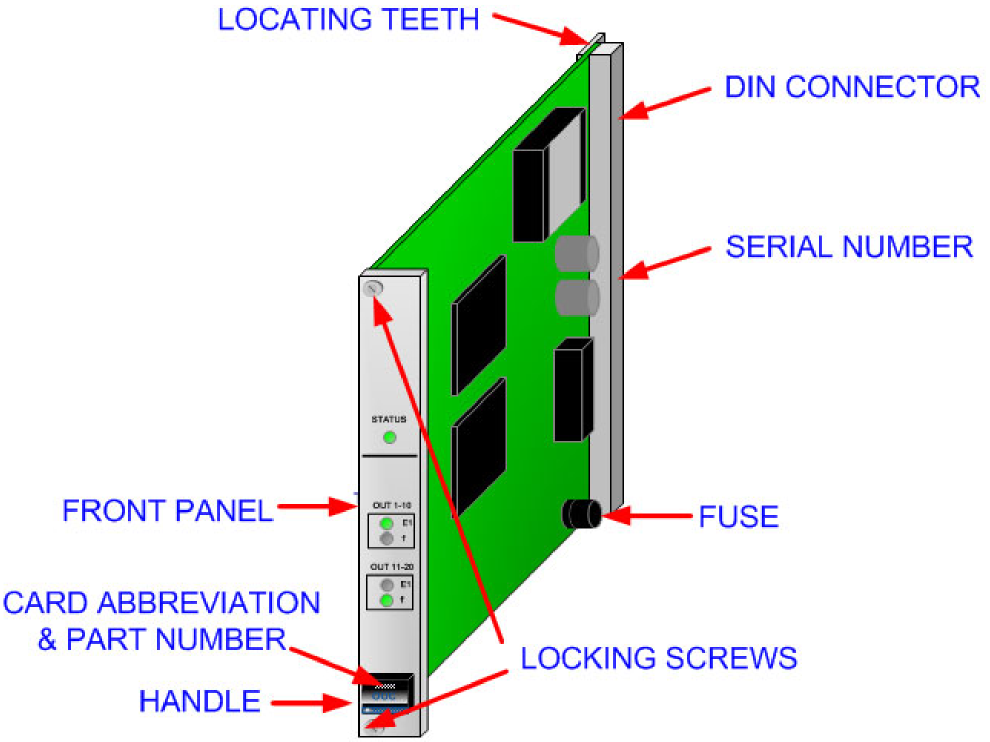


Figure 2-19 : Physical Card Description

- **Front panel**
  This is the metallic panel where LEDs and some of the following components are on.
- **Locking screws**
  These 2 screws are necessary to tighten the card into the shelf. It is important to tighten the card in order to avoid any instability.
- **Bail handle**
  The bail handle permits removal of the card from its slot, by pushing down while extracting the card.
- **Card abbreviation**
  This is the abbreviation name of the card. i.e. OUC for OUtput Card
- **Fuse**
  This easily removable component protects the card against over-voltage and/or short circuit, it is usually located near the DIN connector at the rear of the card.

Warning

Do not remove the fuse without the agreement by an Oscilloquartz technical support person.

- **DIN Connector**
  This grey connector permits the card to be connected to the rest of the shelf. It usually contains 96 pins, except for the MAC cards which have 160 pins.
- **Serial number**
  The serial number of the card is written on the sticker stuck on the DIN connector. On the same sticker, there is the article number of the main board.
- **Locating teeth**
  The card locating teeth prevent card insertion into an incorrect slot. The locating teeth are coded for specific slots.

Warning

Do not modify the code of locating teeth !

2.5.3 INput Card (INC)

2.5.3.1 Physical View

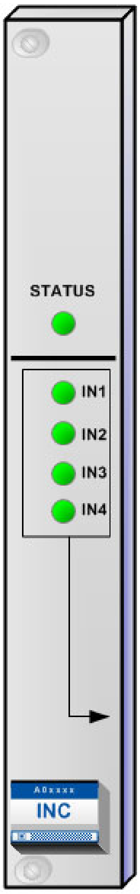


Figure 2-20 : INput Card (INC)

LED	DESCRIPTION
Status	• GREEN Solid: Card system is working properly • RED Solid: Card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • OFF: Card is not working at all
IN1	• GREEN Solid: The related input signal is qualified and provisioned correctly • GREEN Flashing: The Input Line is currently in Wait-To-Restore time • ORANGE Solid: The line is being in MONITORING mode • RED Solid: The input signal is rejected or disqualified by one of the signal validity criteria • RED Flashing: The input is rejected due to a performance alarm • OFF: Input Line unused, disabled or INC in stand-by
IN2	
IN3	
IN4	

Table 2-2 INput Card (INC) LED Description

***Note*:**

- For detailed INC LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.3.2 Main features

The INC card is designed to provide the following functions:

- Input signal processing and provisioning
- Input signal distribution to the THC cards or to the SGC cards when the pass-through function is enabled
- Performance Measurement and reference disqualification when Performance Thresholds are defined.
- Input signal and card 1:1 protection
- Up to 4 inputs processing (up to 4x E1 or 4x Frequency such as 2.048, 5 and 10 MHz)
- Wait-To-Restore (WTR) time function
- Synchronization Status Messaging (SSM) decoding and processing
- Remotely software (also called firmware) upgradeable

2.5.3.3 Operation

The user can insert in the shelf:

- 1 INC, which makes the shelf available for 4 input references without INC card protection.
- 2 INCs, which makes the shelf available for 4 input references with INC card protection.

When two INC cards are installed in the same group, the active one is the card which shows status on any of its IN1…4 LEDs, the stand-by one, has its IN1…4 LEDs extinguished.

The 4 Input references of each INC group can be configured by software or via TL1 commands to any of the 8 available connectors on the Input tile.

The input connector types available for the INC group are:

- 4x E1 BNC 75 ohms connectors (asymmetrical)
- 4x Frequency BNC 75 ohms connectors (asymmetrical)

There is the possibility to install an adapter 120/75 (Balun) to get the symmetrical option.

It is possible to configure each input reference as ENABLE to make it available for selection by the 5548C when qualified by the INC; MONITORED in order to measure its performances without allowing the 5548C to select it or DISABLE to disallow the 5548C to select it and to avoid reporting alarms about it.

In cooperation with the THC group, the INC can also disqualify an input reference if it crosses a user defined Performance Threshold.

The INC card delivers up to 4 input signals to the THC group. When at least one input has been configured as E1 or 2.048MHz among the 4 input references, it provides also a clock to the SGC group in case of Passthrough mode, when both THC cards are removed or being in warm-up or failure.

2.5.3.4 INC Block Diagram

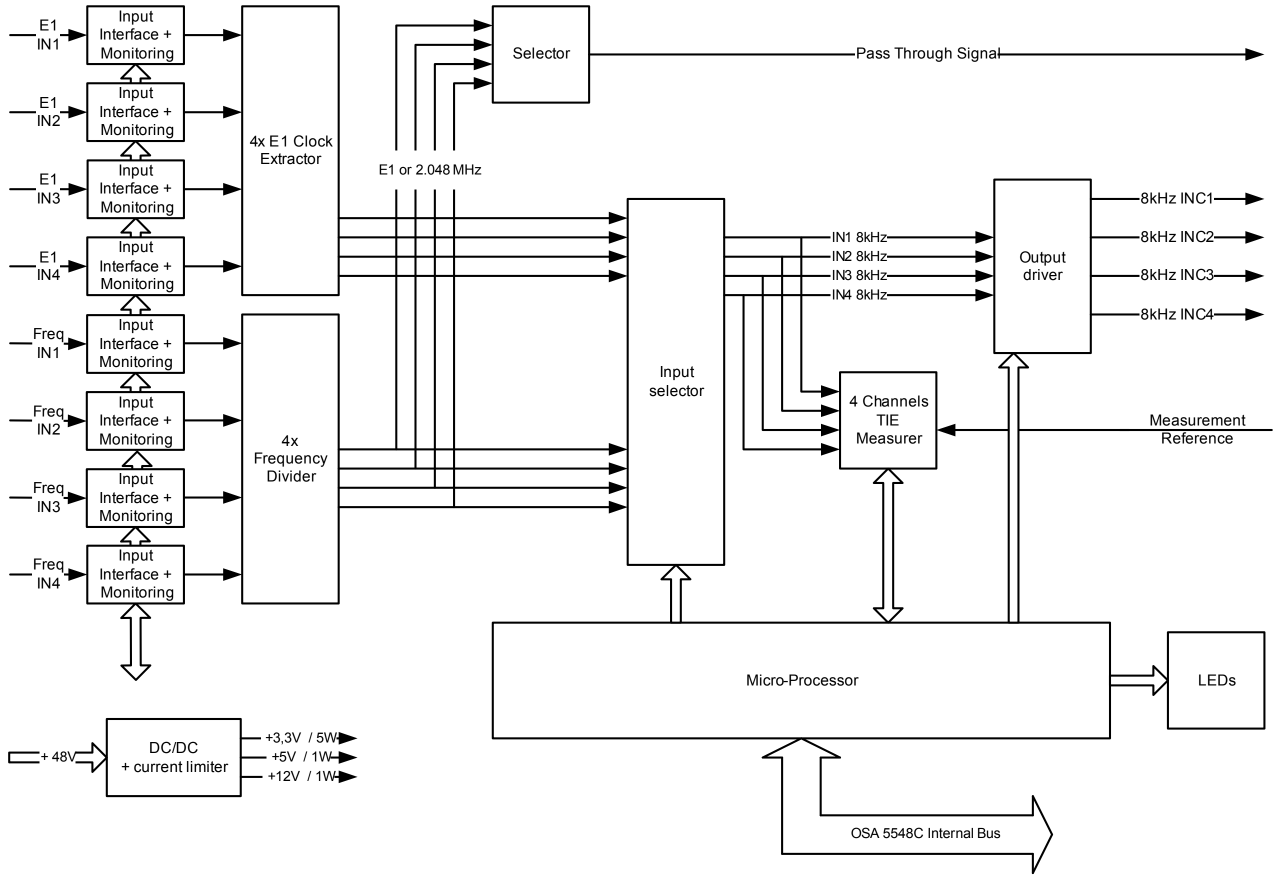


Figure 2-21 : Input Card - Block Diagram

2.5.4 GPS Card (GPS)

2.5.4.1 Physical View

Figure 2-22 : GPS Card (GPS)

LED	DESCRIPTION
Status	• GREEN Solid: Card system is working properly • RED Solid: Card system is currently not working properly or GPS card is in initialization phase. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • OFF: Card is not working at all
GPS	• GREEN Solid: GPS signal reception is OK, PPS input reference available • RED Solid: No or not enough GPS signal available. PPS input reference not available. • RED Flashing: No connection to GPS Antenna. Either shorted or opened GPS antenna cable. When both GPS and OCXO LEDs have this status, the input is rejected due to a performance alarm. • Yellow: The GPS input is OK but currently monitored • OFF: The GPS input is disabled or the GPS Card is in Stand-by
OCXO	• RED Solid: Internal GPS's OCXO failure or Initialisation phase • RED Flashing: GPS pre-tracking sequence. When both GPS and OCXO LEDs have this status, the input is rejected due to a performance alarm. • OFF: When the GPS LED is GREEN solid, the GPS card delivers signal to the THC. Or the GPS card is in stand-by when the GPS LED.

Table 2-3 GPS Card LED Description

***Note*:**

- For detailed GPS LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.4.2 Main features

The GPS card is designed to provide the following functions:

- GPS signal tracking and processing from up to 12 satellites
- Input signal distribution to the THC cards or to the SGC cards when the pass-through function is enabled.
- Performance Measurement and reference disqualification when Performance Thresholds are defined.
- GPS card 1:1 protection
- Synchronization Status Messaging (SSM) quality according to the GPS operation status
- Manual position provisioning for location where condition of GPS reception are bad, such as “urban canyon”
- UTC-based and GPS-based time source
- Remotely software (also called firmware) upgradeable

2.5.4.3 Operation

The user can insert in the shelf:

- 1 GPS, which makes the shelf available for an input reference from one GPS antenna.
- 2 GPS, which makes the shelf available for input reference from two GPS antennas.

When two GPS cards are installed, one is active and the other is in stand-by. The GPS antenna connectors are 2x BNC 50 ohms located on the Input Tile.

It is possible to configure each input reference as ENABLE to make it available for selection by the 5548C when qualified by the GPS card; MONITORED in order to measure its performances without allowing the 5548C to select it or DISABLE to disallow the 5548C to select it and to avoid reporting alarms about it.

In cooperation with the THC group, the GPS can also disqualify its input reference if it crosses a user defined Performance Threshold.

The GPS group delivers one input signal to the THC group. It provides also a clock to the SGC group in case of Passthrough mode, when both THC cards are removed or being in warm-up or failure.

As soon as the GPS card is powered, it starts researching and acquiring GPS satellites. This sequence should last 5 minutes. Then the GPS internal filtering system enters in pre-tracking phase for 200s. Thereafter, the GPS card is able to provide its signal to the rest of the shelf.

2.5.4.4 GPS Block Diagram

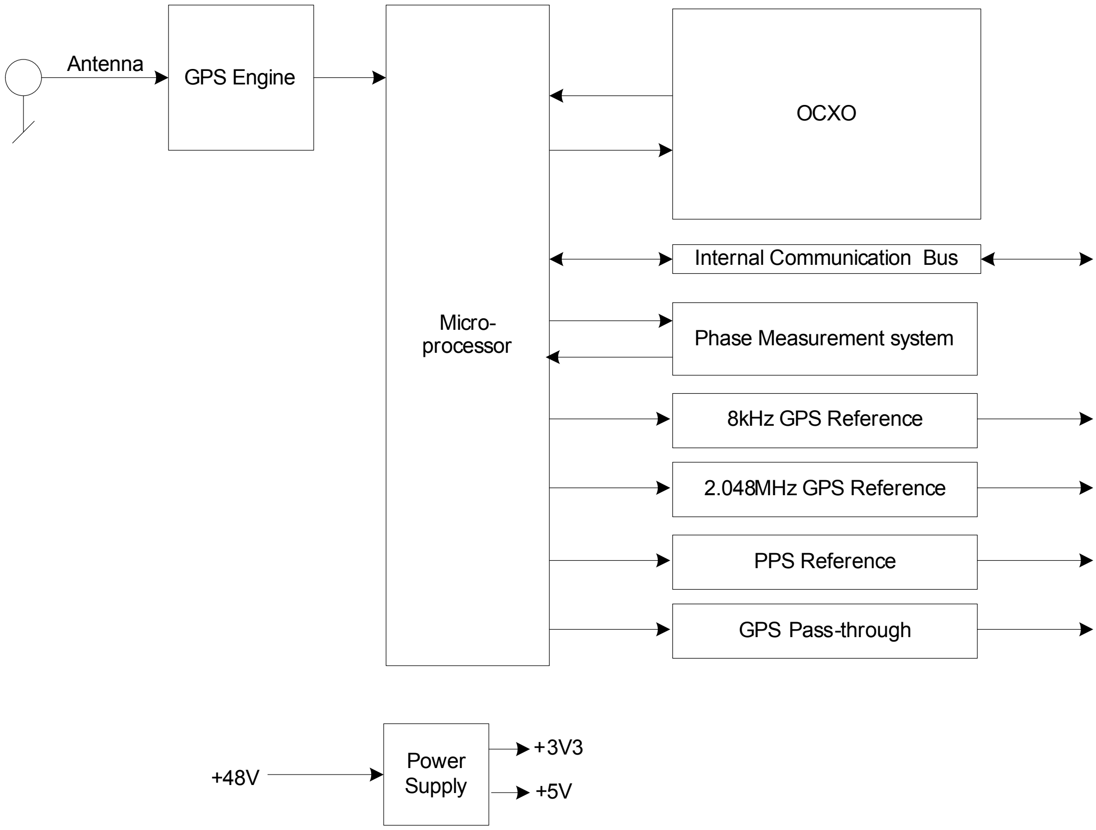


Figure 2-23 : GPS Card - Block Diagram

2.5.5 GNSS Card

2.5.5.1 Physical View

Figure 2-24 : GNSS Card (GLN)

LED	DESCRIPTION
Status	• GREEN Solid: Card system is working properly • RED Solid: Card system is currently not working properly or GNSS card is in initialization phase. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • OFF: Card is not working at all
GNSS	• GREEN Solid: GNSS signal reception is OK, PPS input reference available • RED Solid: No or not enough GNSS signal available. PPS input reference not available. • RED Flashing: No connection to GNSS Antenna. Either shorted or opened GPS antenna cable. When both GNSS and OCXO LEDs have this status, the input is rejected due to a performance alarm. • Yellow: The GNSS input is OK but currently monitored • OFF: The GNSS input is disabled or the GNSS Card is in Stand-by
OCXO	• RED Solid: Internal GNSS's OCXO failure or Initialisation phase • RED Flashing: GNSS pre-tracking sequence. When both GNSS and OCXO LEDs have this status, the input is rejected due to a performance alarm. • OFF: Card is in stand-by without XO alarm.

Table 2-4 GNSS Card LED Description

***Note*:**

- For detailed GPS LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.5.2 Main Features

The GPS card is designed to provide the following functions:

- GNSS signal tracking and processing from up to 24 satellites
- Input signal distribution to the THC cards or to the SGC cards when the pass-through function is enabled.
- Performance Measurement and reference disqualification when Performance Thresholds are defined.
- GNSS card 1:1 protection
- Synchronization Status Messaging (SSM) quality according to the GNSS operation status
- Manual position provisioning for location where condition of GNSS reception are bad, such as “urban canyon”
- UTC-based and GNSS-based time source
- Remotely software (also called firmware) upgradeable

2.5.5.3 Operation

The user can insert in the shelf:

- 1 GNSS, which makes the shelf available for an input reference from one GNSS antenna.
- 2 GNSS, which makes the shelf available for input reference from two GNSS antennas.

When two GNSS cards are installed, one is active and the other is in stand-by. The GNSS antenna connectors are 2x BNC 50 ohms located on the Input Tile.

It is possible to configure each input reference as ENABLE to make it available for selection by the 5548C when qualified by the GNSS card; MONITORED in order to measure its performances without allowing the 5548C to select it or DISABLE to disallow the 5548C to select it and to avoid reporting alarms about it.

In cooperation with the THC group, the GNSS can also disqualify its input reference if it crosses a user defined Performance Threshold.

The GNSS group delivers one input signal to the THC group. It provides also a clock to the SGC group in case of Pass through mode, when both THC cards are removed or being in warm-up or failure.

As soon as the GNSS card is powered, it starts researching and acquiring GNSS satellites. This sequence should last 8 minutes. Then the GNSS internal filtering system enters in pre-tracking phase for 200s. Thereafter, the GNSS card is able to provide its signal to the rest of the shelf.

2.5.5.4 GNSS Block Diagram

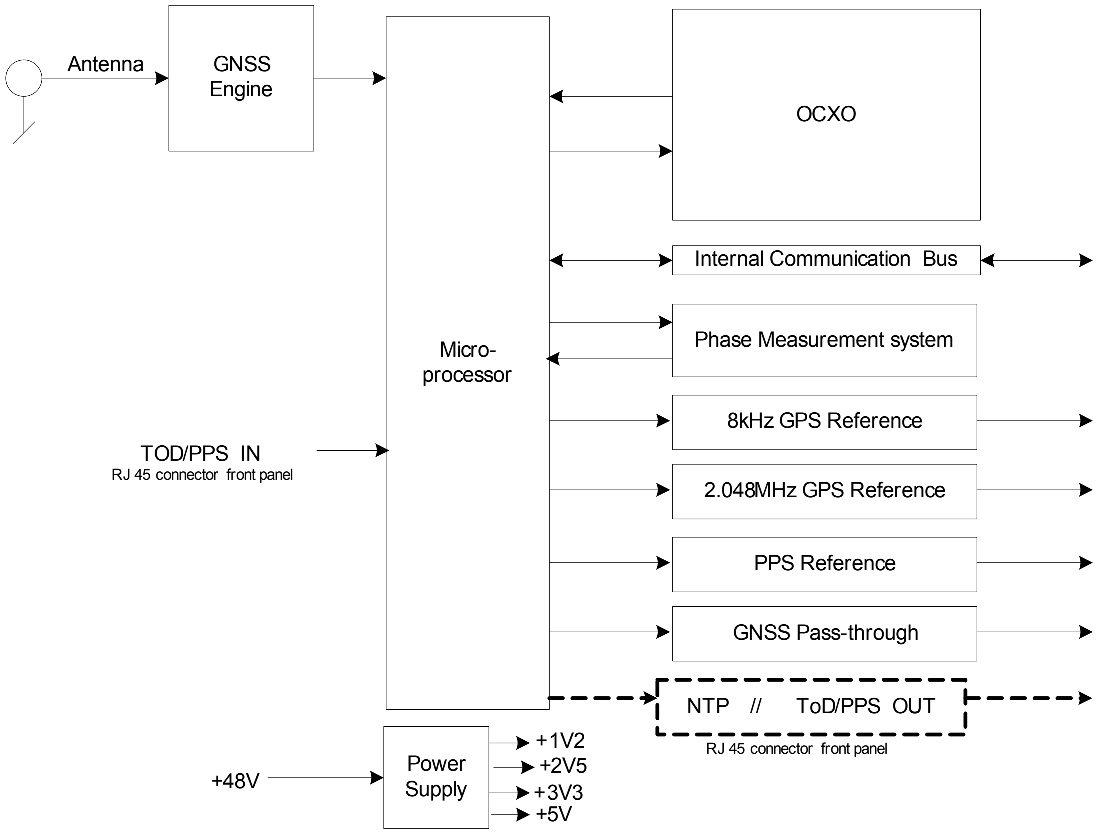


Figure 2-25 : GNSS Card - Block Diagram

2.5.6 Tracking Holdover Card (THC)

2.5.6.1 Physical Layout

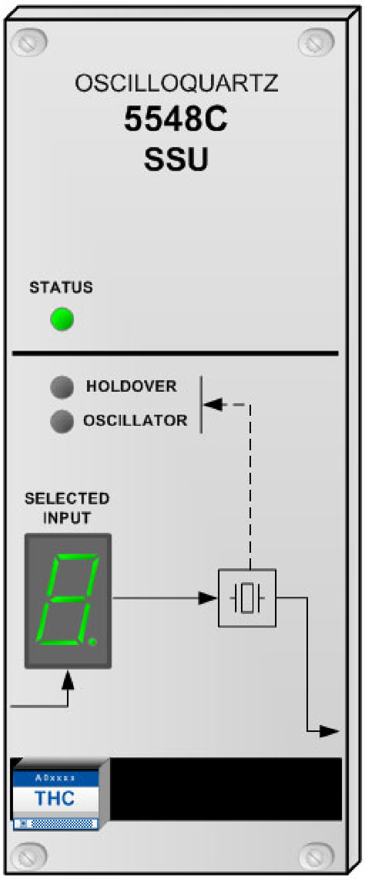


Figure 2-26 : THC Card (THC)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. <u>Note that at the start-up, this status remains until the THC is able to provide a proper clock signal, usually, once the warm-up sequence has ended</u>. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
Holdover	• RED Solid: Holdover/Freerun • RED Flashing: Fast Start-up
Oscillator	• RED Solid: Oscillator failure • RED Flashing: Oscillator in Warm-up
Selected Input	The displayed number is the input line (IL) currently selected by the system, 1 to 4 are IL from the INC group (i.e. 1= IL-1-1, 2 = IL-1-2, …). G is the GPS IL. When the "dot" lit, it means that at least one Input Line is qualified by the INC group. The "dash" means that the THC is in holdover or in freerun mode.

Table 2-5 THC Card LED Description

Note:

- For detailed THC LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.6.2 Main features

The THC card is designed to provide the following functions:

- Input selection based on:
  - Input priority table
  - SSM quality level
  - manual selection
- Jitter and Wander filtering using embedded MADDS (Manual & Automatic Direct Digital Synthesis) system in association with a quartz or rubidium oscillator
- Provides SSU Type 2 (with rubidium) or SSU-A Type I and V (with quartz oscillator) holdover capability
- SSM management
- Distributing signal to the SGC cards
- Squelching outputs in case of non valid signal
- 1:1 card protection
- Remotely software (also called firmware) upgradeable

2.5.6.3 Operation

The user can insert one or two THC cards in the THC group depending on protection requirements.

When two THC cards are installed, the active one is the card which shows the currently SELECTED INPUT status on its digital LED display.

When powered on from a cold start, the THC card requires time to warm up the internal oscillator. The delay varies with oscillator type and card temperature. Typical cold start warm up period is up to 30 minutes. When the THC is ready, and an input reference is qualified by the INC card(s), the THC enters a “fast start” mode, synchronizing the internal clock phase to that of the input signal as quickly as possible. Upon completion of the “fast start” mode, the THC enters the “normal” mode.

The same sequence applies to card replacement, where a stand-by THC in the adjacent slot becomes active, initiating a short holdover cycle, and the transitioning into “fast start” mode, quickly aligning the input signal phase to the stand-by THC oscillator, and about one minute later, completes the transition into “normal” mode. The “warm-up” mode is indicated by a flashing red OSCILLATOR LED. The “holdover” mode is indicated as a solid RED indication, “fast start” mode as the flashing GREEN indication and the normal mode as the solid GREEN indication of the holdover LED on the THC.

When all qualified input references are absent or unavailable, the THC provides a source for synchronization output signals, known as “holdover” mode. THC “freerun”

mode occurs when THC is cold started, and has not been aligned to any qualified input signals yet. When in “freerun” mode, the holdover LED is also solid red.
It is also possible to configure the THC by software or via TL1 commands according to various input reference selection modes, such as:

- User defined priority table
- Input signal alarms detection
- Input signal performance measurements
- Synchronization Status Message (SSM)

The THC card integrates a system called MADDS (Manual & Automatic Direct-Digital Synthesis). This system processes and filters the signal selected as reference. The MADDS is a module, which has its own upgradeable software.

The THC pair of modules ensures phase alignment between both cards, in the instance that an active THC is removed.

2.5.6.4 THC Block Diagram

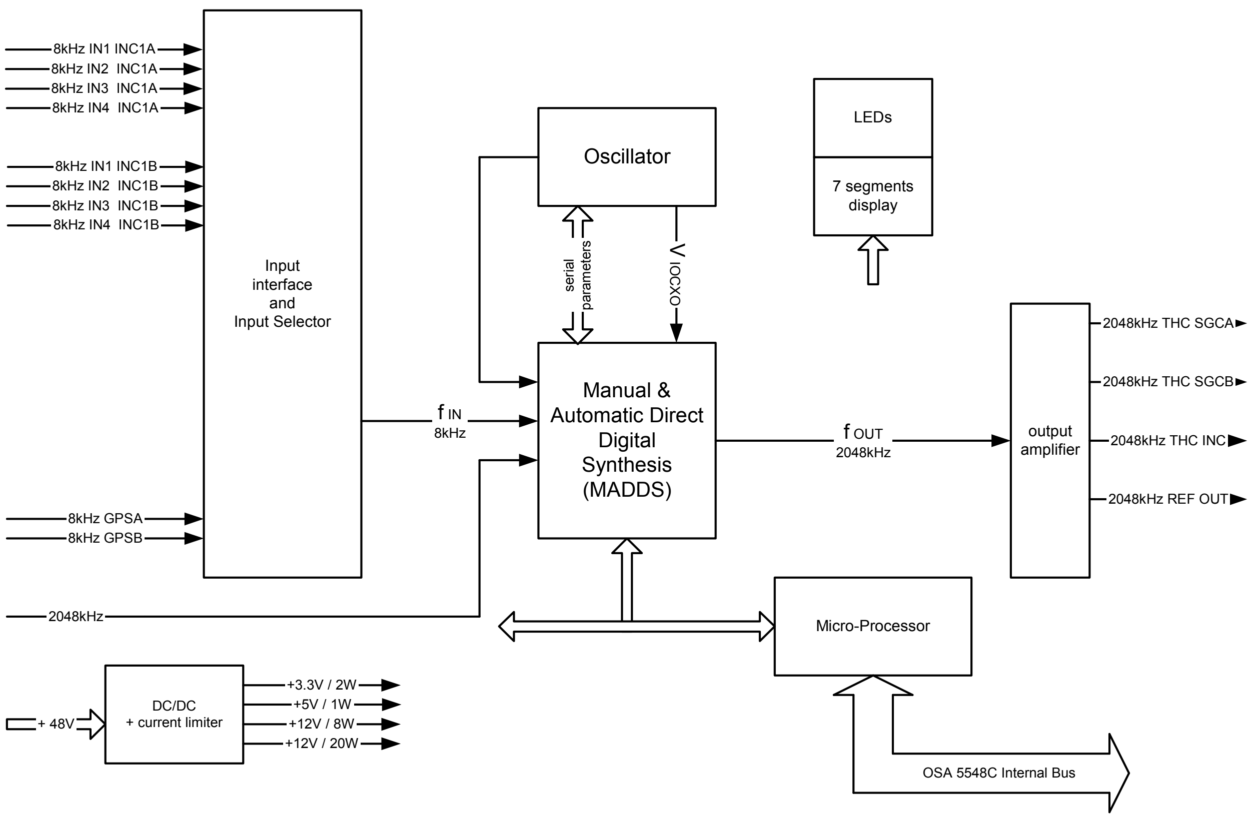


Figure 2-27 : Tracking Holdover Card - Block Diagram

2.5.7 Signal Generator Card (SGC)

2.5.7.1 Physical Layout

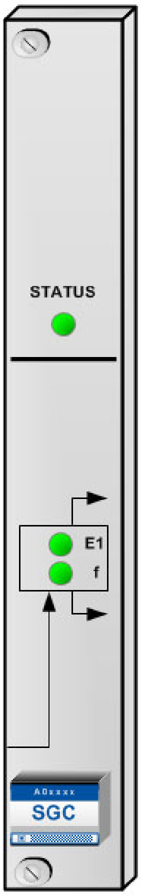


Figure 2-28 : SGC Card (SGC)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
E1	• GREEN Solid: E1 generated properly • GREEN Flashing: Pass-through mode • RED Solid: E1 generation failure • RED Flashing: No clock signal received by the SGC
f	• GREEN Solid: Frequency and PPS generated properly • GREEN Flashing: Pass-through mode • RED Solid: Frequency and/or PPS generation failure • RED Flashing: No clock signal received by the SGC

Table 2-6 SGC Card LED Description

***Note*:**

- For detailed SGC LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.7.2 Main features

The SGC card is designed to provide the following functions:

- Generation of 2x E1, 2.048MHz and 1 PPS signals
- Two E1 options with different code and frame (HDB3 or AMI, CRC-4 and CCS or CAS) are user configurable allowing 2 different E1 format selectable on output connectors
- Distribution of signals to the OUC cards
- Receiving signal from the INC cards in case of pass-through mode
- SSM generation
- 1:1 card protection
- Remotely software (also called firmware) upgradeable

2.5.7.3 Operation

The user can insert one or two SGC cards in the SGC group depending on protection requirements.

When two SGC cards are installed, both are active.

The SGC card receives a signal from the THC group or from INC when the 5548C is in pass-through mode. When no signal is detected, it squelches its outputs to prevent any signal to the rest of the shelf.

The SGC generates all signals types for OUC, NTP, PTP cards, Expansion shelves and PPS outputs, such as:

- Two independent E1
- 2.048MHz
- PPS

2.5.7.4 SGC Block Diagram

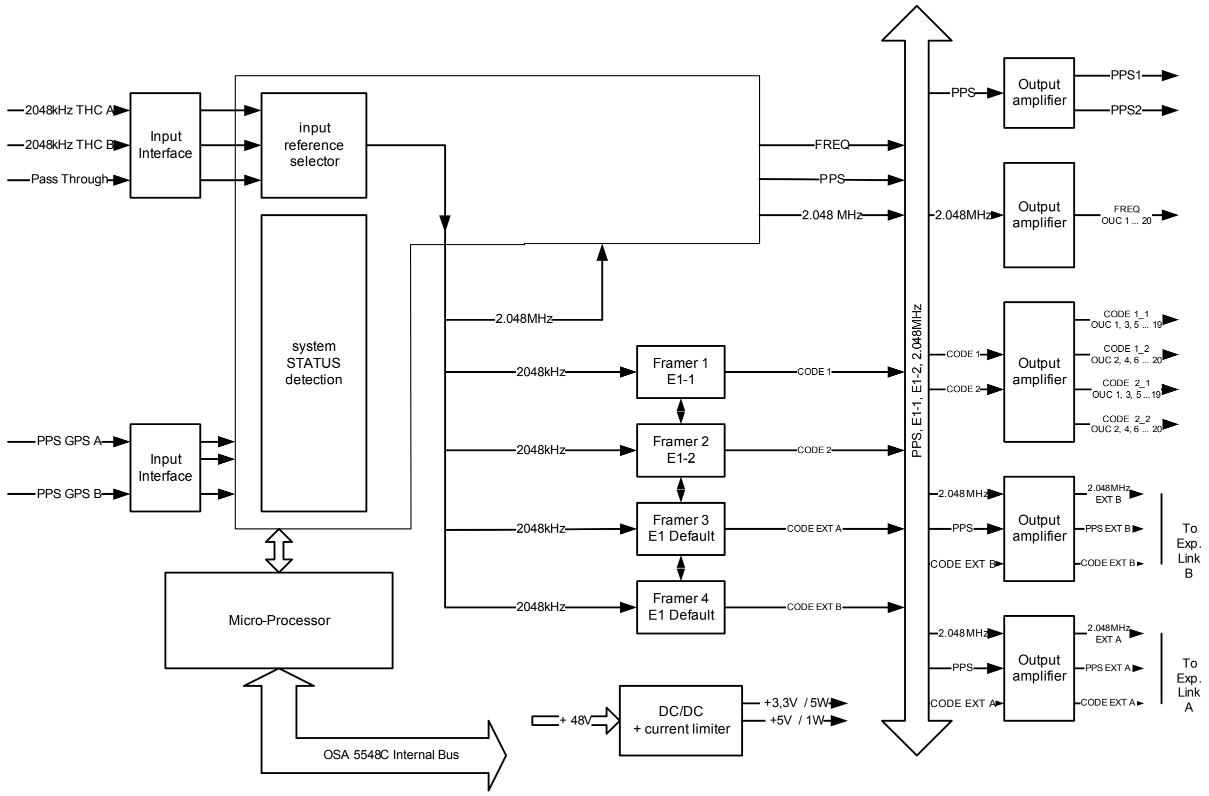


Figure 2-29 : Signal Generator Card - Block Diagram

2.5.8 OUtput Card (OUC)

2.5.8.1 Physical Layout

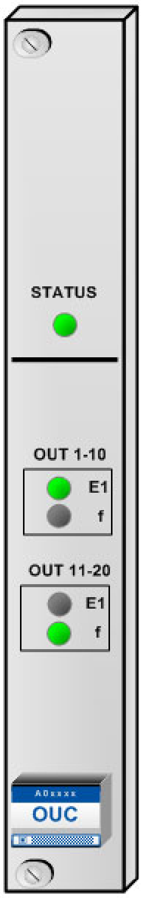


Figure 2-30 : OUtput Card (OUC)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
OUT 1-10 E1	• GREEN Solid: E1 distributed properly to Output ports 1 to 10 • RED Solid: No E1 distribution to Output ports 1 to 10 • RED Flashing: No clock signal received by the OUC • OFF: The related outputs are not configured to supply E1 clock to Output ports 1 to 10.
OUT 1-10 f	• GREEN Solid: 2.048 MHz distributed properly to Output ports 1 to 10 • RED Solid: No 2.048 MHz distribution to Output ports 1 to 10 • RED Flashing: No clock signal received by the OUC • OFF: The related outputs are not configured to supply 2.048 MHz clock to Output ports 1 to 10
OUT 11-20 E1	• GREEN Solid: E1 distributed properly to Output ports 11 to 20 • RED Solid: No E1 distribution to Output ports 11 to 20 • RED Flashing: No clock signal received by the OUC • OFF: The related outputs are not configured to supply E1 clock to Output ports 11 to 20
OUT 11-20 f	• GREEN Solid: 2.048 MHz distributed properly to Output ports 11 to 20 • RED Solid: No 2.048 MHz distribution to Output ports 11 to 20 • RED Flashing: No clock signal received by the OUC • OFF: The related outputs are not configured to supply 2.048 MHz clock to Output ports 11 to 20

Table 2-7 OUput Card (OUC LED Description

Note:

- For detailed OUC LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.8.2 Main features

The OUC card is designed to provide the following functions:

- Selection of the output signal to be distributed according to the user configuration
- Distribution of 2.048 MHz frequency (ITU-T G.703-13) and/or E1 signal (ITU-T G.703-9) to 20 output ports
- Card and output 1:1 protection
- Manual output squelching
- Output circuit short detection
- Remotely software (also called firmware) upgradeable

2.5.8.3 Operation

The user can insert one or two OUC cards in each of the OUC groups depending on protection requirements.

When two OUC cards are installed, both are active.

The OUC card receives a signal from the SGC group. The signal types delivered on the 20 outputs is defined by the user configuration.

The user has a choice of 3 output configurations per group of 10 outputs:

- E1 with user configuration no.1
- E1 with user configuration no.2
- 2.048 MHz frequency according to ITU-T G.703-13

The output ports can be configured to show alarm when outputs are shorted or opened.

2.5.8.4 OUC Block Diagram

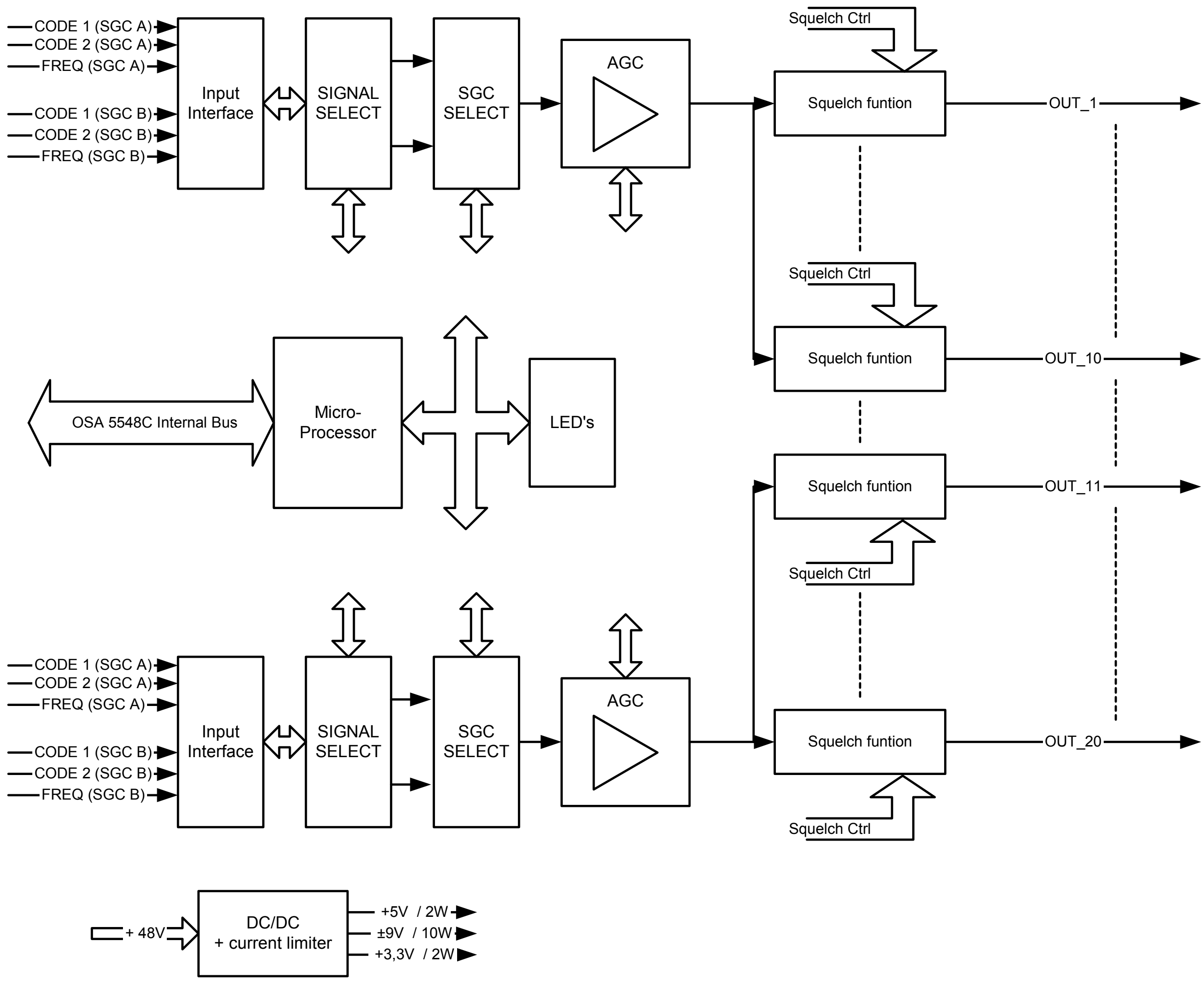


Figure 2-31 : Output Card - Block Diagram

2.5.9 Time Code Card – NTP (TCC-NTP)

2.5.9.1 Physical Layout

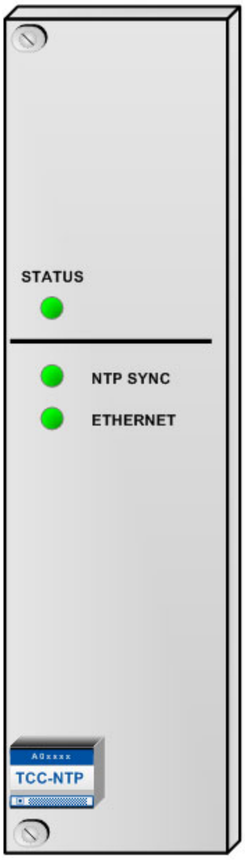


Figure 2-32 : Time Code Card NTP (TCC-NTP)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
NTP SYNC	• RED Solid: The card system is currently in power up mode, wait TOD UTC GPS or server failure. • RED Flashing: Waiting synchronization, TOD UTC GPS received • GREEN Solid: NTP worked properly • GREEN flashing: TOD UTC GPS lose, NTP is waiting locked. • ORANGE when the NTP module is being downloaded
ETHERNET	• GREEN Solid: Ethernet cable connected • OFF: Ethernet cable disconnected

Table 2-8 Time Code Card-NTP (TCC-NTP) LED Description

Ethernet port access directly on TCC-NTP Card.

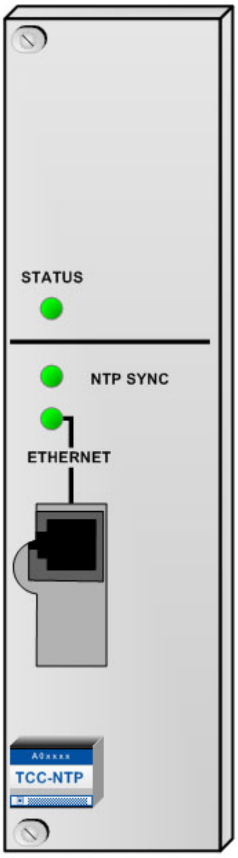


Figure 2-33 : Time Code Card NTP (TCC-NTP)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
NTP SYNC	• RED Solid: The card system is currently in power up mode, wait TOD UTC GPS or server failure. • RED Flashing: Waiting synchronization, TOD UTC GPS received • GREEN Solid: NTP worked properly • GREEN flashing: TOD UTC GPS lose, NTP is waiting locked. • ORANGE when the NTP module is being downloaded
ETHERNET	• GREEN Solid: Ethernet cable connected • OFF: Ethernet cable disconnected

Table 2-9 Time Code Card-NTP (TCC-NTP) LED Description

2.5.9.2 Main Features (TCC-NTP)

- Stratum 1 NTP server
- Configuration by DHCP or Fixed IP
- 64 MD5 Message-Digest Algorithm
- Plug-and-play installation
- Can be inserted in any of the OUC slots
- Remotely software upgradeable

2.5.9.3 Operation

The NTP card receives a signal from the SGC group and from the GPS group. There are two modes:

- Needs a GPS card and PPS signal from SGC card to power up and to synchronize the UTC time
- Generates a minor alarm if the Time Of Day (TOD) disappears although the performance will be affected more than 1 year later.
- Generates a major alarm if the PPS from SGC card disappear.

2.5.9.4 TCC-NTP Block Diagram

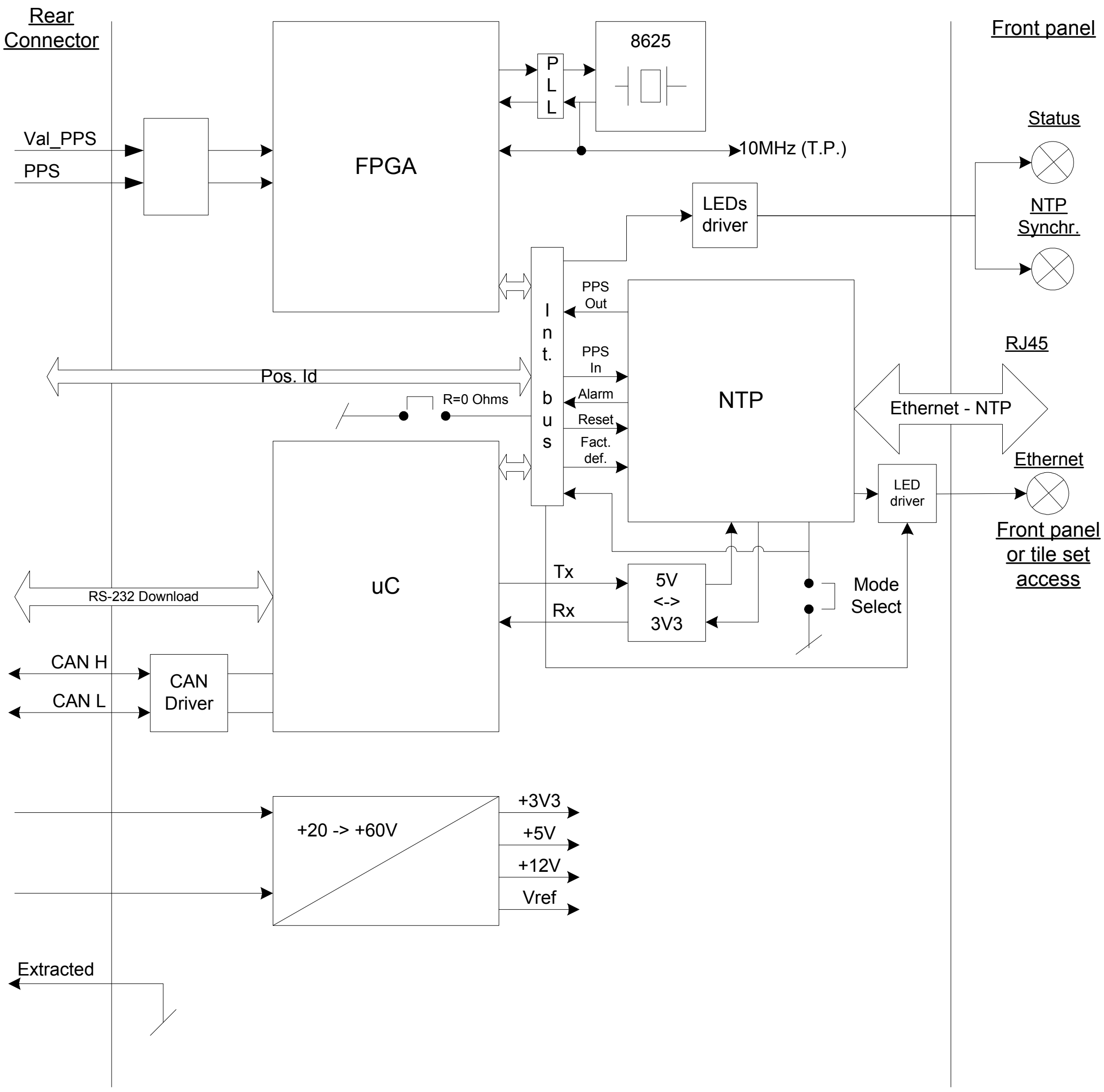


Figure 2-34 : NTP Card - Block Diagram

2.5.10 Time Code Card – PTP (TCC-PTP)

2.5.10.1 Physical Layout

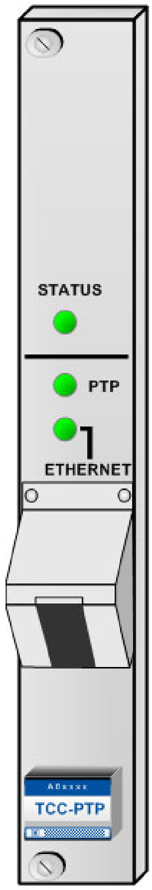


Figure 2-35 : Time Code Card PTP (TCC-PTP)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
PTP	• RED Solid: The card system is currently in power up mode, wait PPS/TOD UTC GPS or server failure. • RED Flashing: input reference is available and the card is synchronizing • GREEN Solid: PTP service available • GREEN flashing: PTP alarm which doesn't affect the operational state. PTP port is always active. • ORANGE when the PTP module is being downloaded • OFF PTP port disabled
ETHERNET	• GREEN Solid: Ethernet cable connected • OFF: Ethernet cable disconnected
SFP	• Ethernet link

Table 2-10 Time Code Card-PTP (TCC-PTP) LED Description

2.5.10.2 Main Features (TCC-PTP)

- Server accuracy, PPS reference +/- 50ns
- Global accuracy on data network is depending on traffic and topology.
- Number of PTP slaves supported:

  128 slaves @ 16 Sync/s

  80 slaves @ 32 Sync/s

  40 slaves @ 64 Sync/s

  (These numbers are only valid in Unicast and One-step modes)
- 6x TCC-PTP cards available for 5548C E60 SSU
- 20x TCC-PTP cards available for 5548C E200 SSU
- PTP load sharing between different groups of TCC-PTP cards
- One or two-step clock
- **UNICAST**, MULTICAST and MIXED addressing mode
- Ethernet/UDP transmission protocol
- Configuration of the PTP domain
- Configuration by DHCP or Fixed IP
- Plug-and-play installation
- Can be inserted in any of the OUC slots
- Software is remotely upgradeable

2.5.10.3 Integration in 5548C

The TCC-PTP card can be inserted in any of the slots reserved to the OUCs. TCC-PTP cards are fully independent One or two slots may be used indifferently, however, only cards of the same type may share the 2 slots belonging to that group:

- It is not possible to install OUC and TCC-PTP in the same group.
- The tile-set related to that group must correspond to the TCC-PTP card.

The PTP card receives its timing reference from the SGC and GPS groups.
Both types of cards must be present in the shelf for the TCC-PTP to run properly.

If no GPS card is present or if this has never been tracked, the TOD Not detected alarm is raised.

If the timing reference provided by the GPS card is lost but the TCC-PTP was previously locked to it, the Loss of TOD alarm is raised.

If all the SGC boards fail or are extracted, the PPS Loss alarm is raised.

2.5.10.4 PTP Load Sharing with the TCC-PTP

In a UNICAST based network, the slaves in a given domain may loose the connection to their master because of a failure in the network or in the master itself. If they are configured to use the UNICAST message negotiation, that is, if they have a list of master in their Acceptable Master Table, they will try to switch to a redundant master in the same domain if available.

The new elected Grandmaster will then receive UNICAST message negotiation from many slaves and could possibly not being able to deal with all of them. It is then good practice to share this additional set of slave across a given number of masters and to leave processing resources in case of a fault.
The following diagram describes the load sharing mechanism.

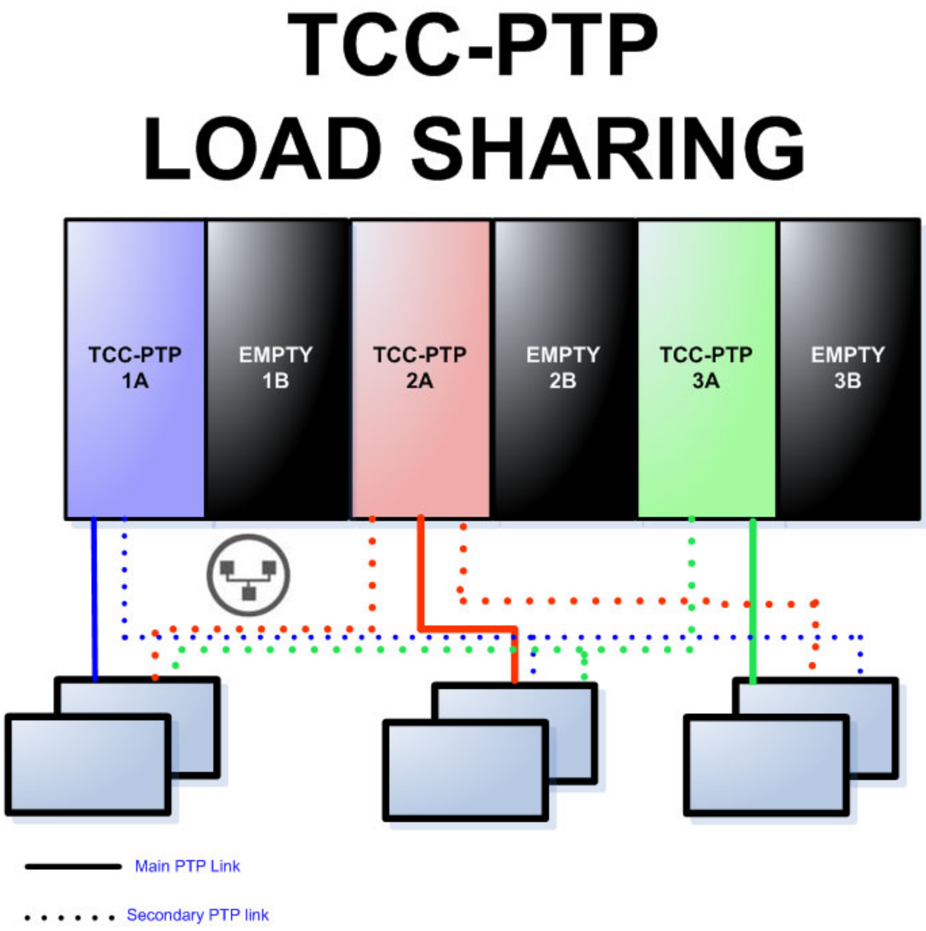


Figure 2-36 : LOAD SHARING (TCC-PTP)

2.5.11 MAnagement Card (MAC)

2.5.11.1 Physical Layout

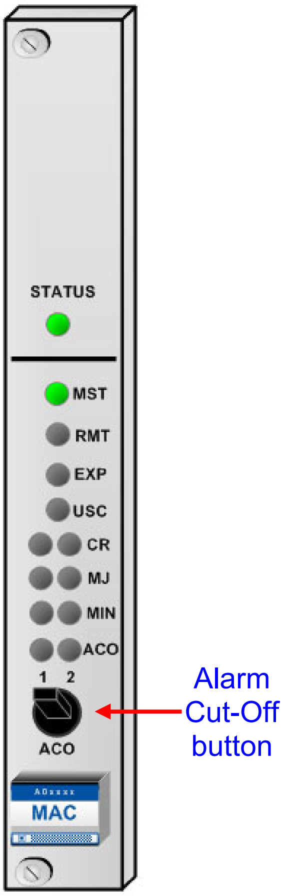


Figure 2-37 : MAgement Card (MAC)

LED	DESCRIPTION
Status	• RED Solid: The card system is currently not working properly or may be in failure. • RED Flashing: Version error • ORANGE Solid: Card's firmware is being upgraded • GREEN Solid: Card system is working properly • OFF: Card is not working at all
MST	• GREEN Solid: Indicates that this is a MASTER shelf
RMT	• This LED is unused in the OSA 5548C SSU version
EXP	• GREEN Solid: Indicates that this is an EXPANSION shelf
USC	• YELLOW Solid: Indicates that at least one user is logged.
CR	• RED Solid: Indicates that there is at least one alarm with a CRITICAL severity
MJ	• ORANGE Solid: Indicates that there is at least one alarm with a MAJOR severity
MIN	• YELLOW Solid: Indicates that there is at least one alarm with a MINOR severity
ACO	• RED Solid: Indicates that at least one alarm has been cut-off

Table 2-11 MAnagement Card (MAC) LED Description

***Note*:**

- For detailed MAC LED status description, refer to section 8.2.1
- For ordering Information, refer to 0

2.5.11.2 Main features

The MAC card is designed to monitor and manage the OSA 5548C SSU, its main features are:

- Gathering the status of all cards
- Management of external output and input alarm
- Management of front panel cards LEDs information.
- Internal card management and communication
- Expansion shelves management and communication
- Ethernet and serial communication management
- Ethernet speed setting 10M or 100M
- Events and alarms storage and timing
- Retaining every card's firmware in its memory
- FTP client for firmware upgrade
- Remotely software (also called firmware) upgradeable

2.5.11.3 MAC Block Diagram

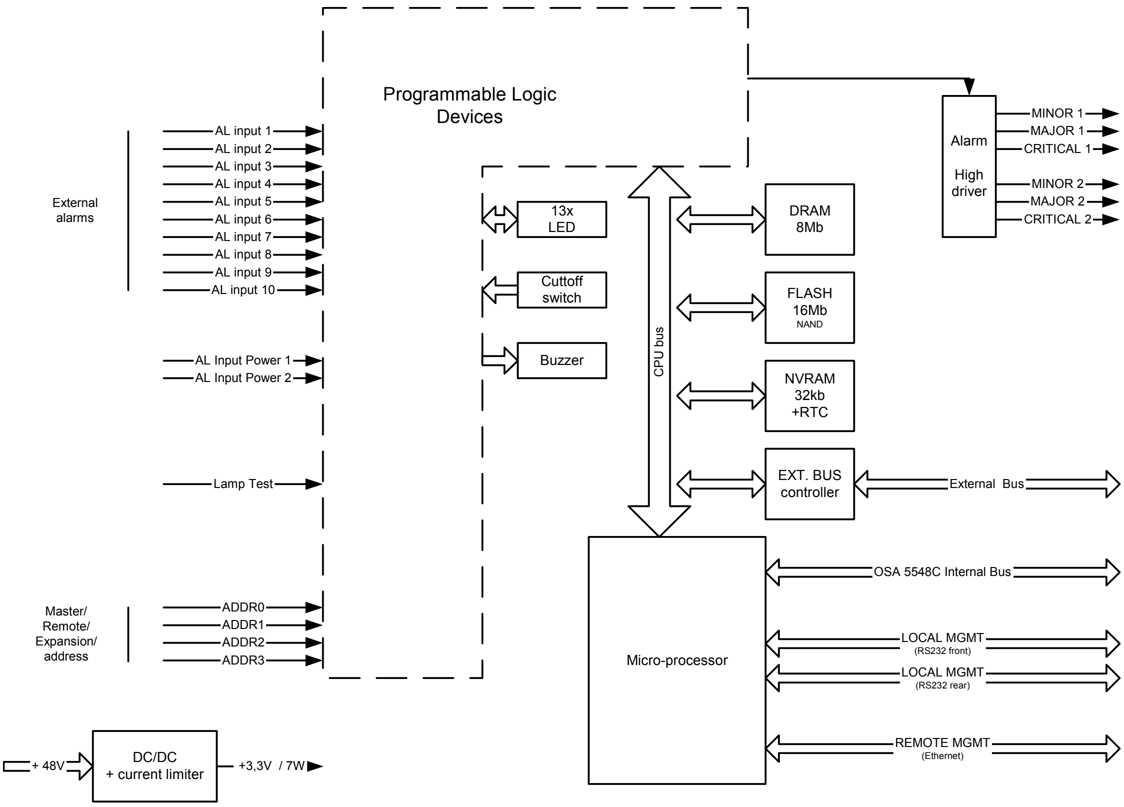


Figure 2-38 : MAnagement Card - Block Diagram

2.5.12 POWER A & POWER B Cards

2.5.12.1 Physical Layout

Power supply fuses are located on the front panel for easy access.

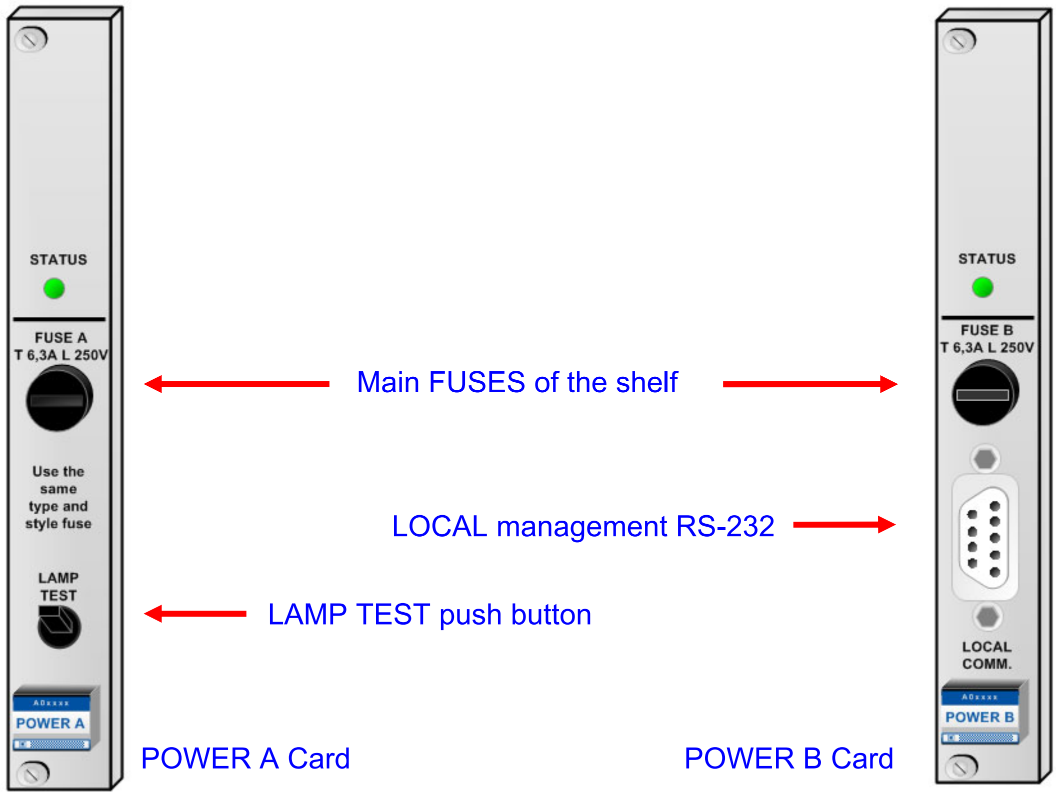


Figure 2-39 : Power Cards (PWR)

LED	DESCRIPTION
Status	• RED Solid: The POWER Card is not fed with POWER • GREEN Solid: POWER supplied correctly

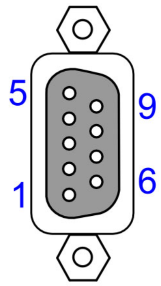
Table 2-12 Power Card (PWR) LED Description

***Note*:**

- For detailed POWER cards LED status description, refer to section 8.2.1
- Specifications of the fuses are described in 0

2.5.12.2 LOCAL COMM. Port

This is a RS-232 serial port SUB-D 9p for local management purpose. A second one is located on the MANAGEMENT Connectors Tile above the card range (see section 2.5.16.3). Both connectors can be used simultaneously.



male

PIN	DESCRIPTION
1	NC
2	RX
3	TX
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

Table 2-13 RS-232 - Local COMM Port Connector Description

***Note*:**

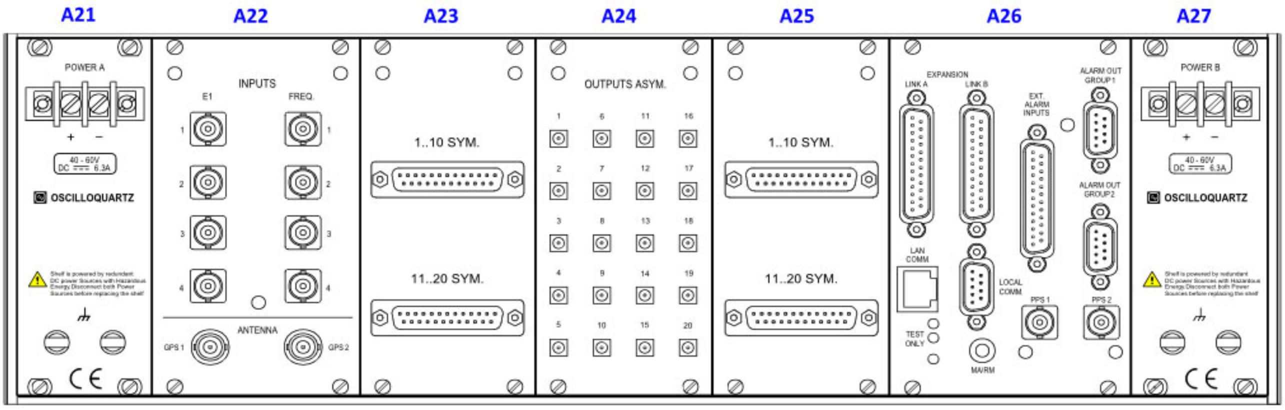
- In TL1 commands, this port is named “RS-FRONT”

2.5.12.3 Main Features

The POWER cards are designed to provide the following functions:

- Distribute the power into all cards
- Present main fuses on front panel
- POWER A card has a switch for LED test
- POWER B has serial RS-232C connector for local management
- POWER B card stores the network parameters

2.5.13 Connectors Panel Layout



Pos.	Tile name	Cards or Slots related to	Description
A21	Power A tile	POWER A card	First Power source connection and grounding
A22	Input tile	INC group	Input ports are split in two types of connectors; 4 for the Frequency and 4 for the E1 references from which the user can cable and use 4 lines. A second group of two BNC connectors are available for GPS antenna connection.
A23	Output tile	A10 & A11	Provides 20 output synchronization ports.
A24	Output tile	A12 & A13	
A25	Output tile	A14 & A15	
A26	Management tile	MAC, SGC groups	Ethernet LAN, Local RS-232, Expansion shelves link, alarms IN and OUT and PPS output connections
A27	Power B connector tile	POWER B card	Second power source and grounding connection

Table 2-14 Connector Tile Locations

2.5.14 Tile Description

The connector tiles have almost the same architecture, such as shown in the figure below:

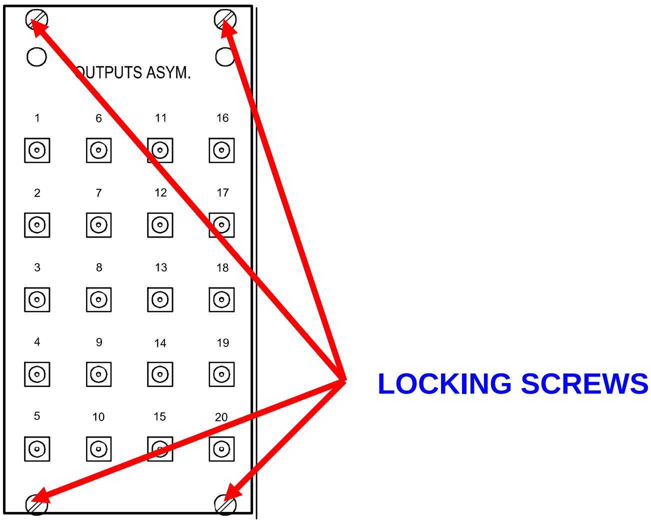


Figure 2-40 : Connector Tile Description

LOCKING SCREWS
4 screws are used to fix the tile onto the shelf.

2.5.15 POWER Connectors Tile

Power supply connectors, for POWER A & B cards are located on two separate POWER connectors tiles, A21 for POWER A and A27 for POWER B. Each one includes two grounding studs.

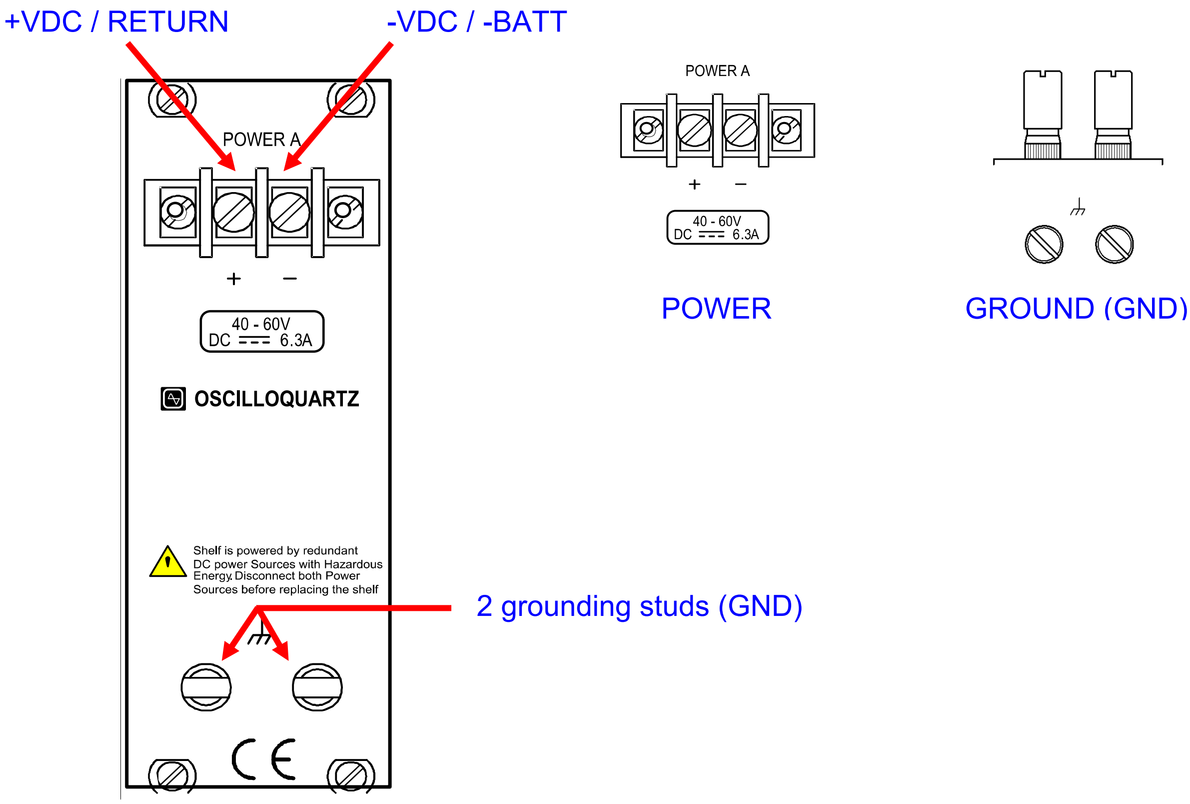


Figure 2-41 : Power Connector Tile

Note:

- For detailed Connection instructions, refer to section 4.3.3

2.5.16 MANAGEMENT Tile

The Management tile provides ports for Local and Remote management, to link expansion shelves, to connect Internal and External alarms and to supply 1 PPS. It is located in position A26, on the top range of the shelf.

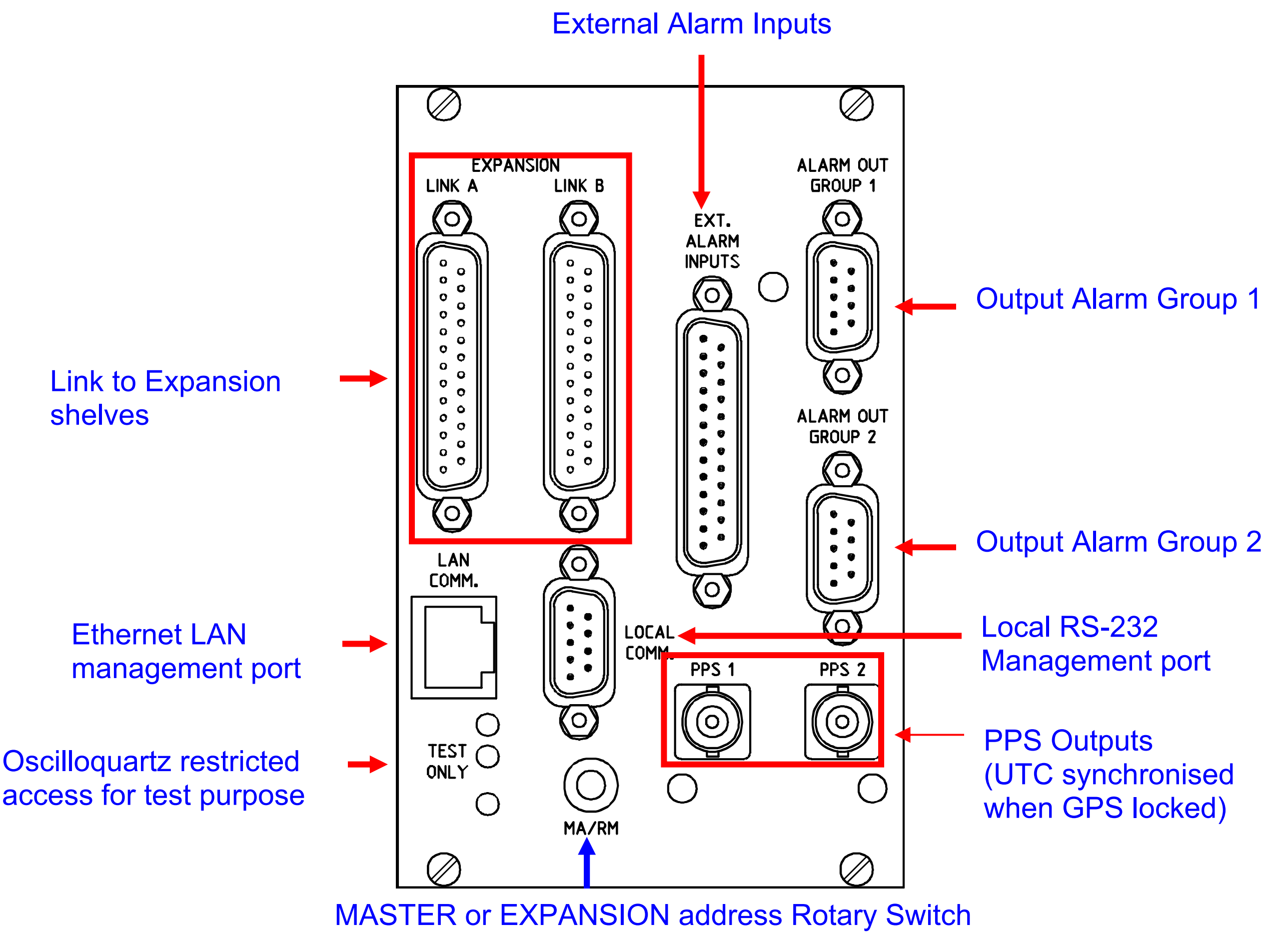


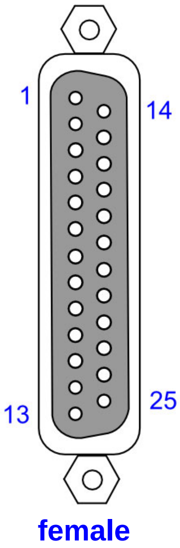
Figure 2-42 : Management Connectors Tile

Note:

- For detailed Connection instructions concerning:
  - o PPS outputs, refer to section 4.5.2.6
  - o IN/OUT Alarms connectors, refer to section 4.6
  - o Communication ports, refer to section 4.7

2.5.16.1 EXPANSION LINK Connectors

Expansion Link SUB-D 25p female connectors are necessary to cable expansion shelves. The EXPANSION LINK B connector is a redundant protection of the EXPANSION LINK A.



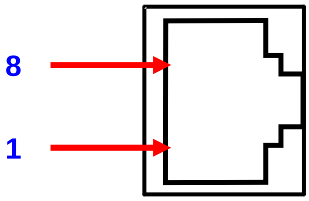
PIN	DESCRIPTION
1	FREQ. SGC A
2	FREQ. SGC B
3	E1+ SGC A
4	E1+ SGC B
5	PPS SGC A
6	PPS SGC B
7	EXP LINK 1
8	EXP LINK 2
9	EXP LINK 3
10	EXP LINK 4
11	NC
12	NC
13	EXTCANH

PIN	DESCRIPTION
14	GND SGC A
15	GND SGC B
16	E1- SGC A
17	E1- SGC B
18	GND
19	GND
20	GND
21	GND
22	GND
23	GND
24	NC
25	EXTCANL

Table 2-15 Expansion Link Connector Description

2.5.16.2 LAN COMM. Port

This socket is a RJ-45 female type to connect Ethernet LAN for remote management.

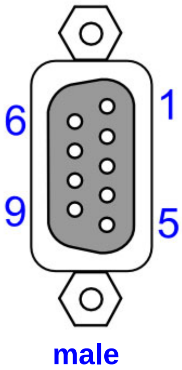


PIN	DESCRIPTION
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

Table 2-16 LAN COMM Port Connector Description

2.5.16.3 LOCAL COMM. Port

This is a RS-232 serial port SUB-D 9p male for local management purpose. A second one is located on the POWER A card on the front of the shelf.



PIN	DESCRIPTION
1	NC
2	RX
3	TX
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

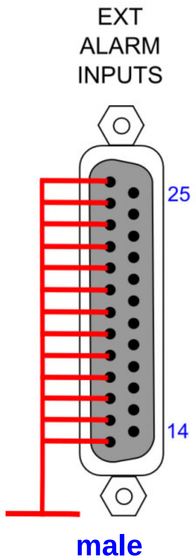
Table 2-17 RS-232 - Local COMM Port Connector Description

Note:

In TL1 commands, this port is named “RS-REAR”

2.5.16.4 EXT. ALARM INPUTS Connector

This SUB-D 25 pins male connector provides 10 input alarms capability to connect input alarms from a third party device to be stored and reported by the 5548C.



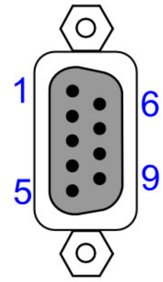
DESCRIPTION	PIN	Severity
Alarm 1	25	CRITICAL
Alarm 2	24	CRITICAL
Alarm 3	23	CRITICAL
Alarm 4	22	MAJOR
Alarm 5	21	MAJOR
Alarm 6	18	MAJOR
Alarm 7	17	MINOR
Alarm 8	16	MINOR
Alarm 9	15	MINOR
Alarm 10	14	Non Alarmed
GROUND (GND)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	-
Not Connected	19, 20	-

Table 2-18 Ext. Alarm Inputs Connector Description

ALARM OUT Connectors

These 2 SUB-D 9 pins female connectors report alarms of the 5548C through Normally Opened (NO) and Normally Closed (NC) relay in order to forward current alarm severity to a third party device.

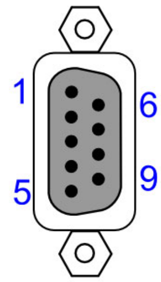
ALARM OUT
GROUP 1



female

ALARM OUT GROUP 1			
SEVERITY	**NO**	**C**	**NC**
CRITICAL	1	6	2
MAJOR	7	3	8
MINOR	4	9	5

ALARM OUT
GROUP 2



female

ALARM OUT GROUP 2			
SEVERITY	**NO**	**C**	**NC**
CRITICAL	1	6	2
MAJOR	7	3	8
MINOR	4	9	5

Figure 2-43 : Alarm Out Connectors

2.5.16.5 Master and Expansion Address Rotary Switch

As the 5548C has the same hardware for MASTER, or EXPANSION shelf functions, this Rotary Switch controls configuration of the shelf as MASTER or EXPANSION shelf address using a flathead screwdriver.

***Caution*:**

The configuration of the shelf with the rotary switch must be done before powering the shelf during the installation and commissioning procedure. The configuration does not change when the shelf is powered.

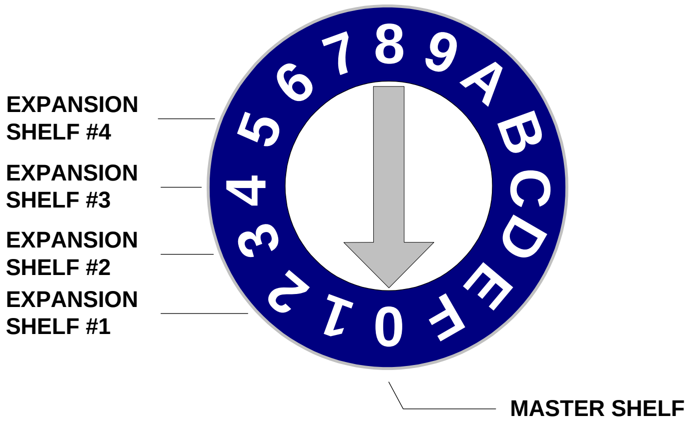


Figure 2-44 : Master & Expansion Rotary Switch

POS.	SELECTION	DESCRIPTION
0	MASTER	In this position the 5548C is configured as a MASTER shelf
1	Not used	This position is not utilized in the 5548C SSU
2	EXPANSION #1	In this position, the shelf is configured as an EXPANSION shelf with address number 1
3	EXPANSION #2	In this position, the shelf is configured as an EXPANSION shelf with address number 2
4	EXPANSION #3	In this position, the shelf is configured as an EXPANSION shelf with address number 3
5	EXPANSION #4	In this position, the shelf is configured as an EXPANSION shelf with address number 4
6…F	Not Used	These selections are reserved for eventual future developments

Table 2-19 Master & Expansion Selection

***Note*:**

The Expansion shelves do not contain INC, GPS, THC and SGC cards. Instead, in the SGC slot position, it is required to insert EGC cards

2.5.17 INPUT Tile

4 Frequency BNC connectors are available for 2.048, 5 or 10 MHz frequency input and 4 E1 BNC connectors are available for up to 4 E1 input. Among these 8 BNC connectors 4 can be used to feed the 5548C with signal. This tile is located in position A22 on the top range of the shelf.

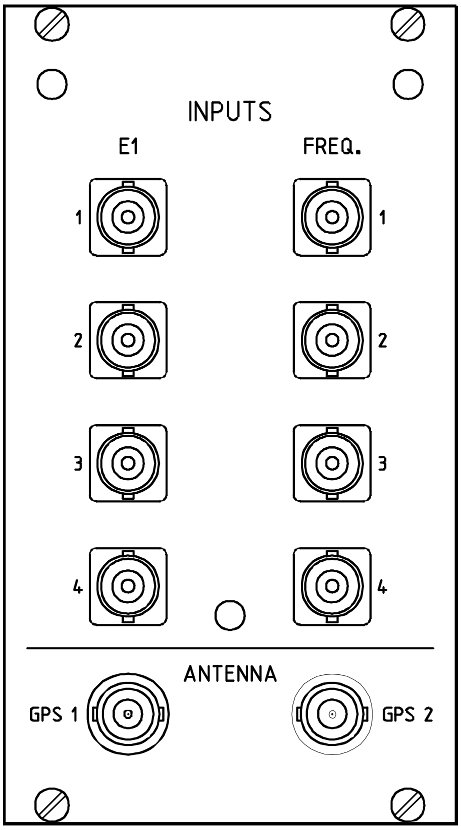


Figure 2-45 : Input Tile

Input Group	
INC A – INC B *	
Input type to connector:	
E1	1
E1	2
E1	3
E1	4
FREQ	1
FREQ	2
FREQ	3
FREQ	4

GPS A	**GPS B**
Antenna GPS 1	Antenna GPS 2

Table 2-20 Input Types and Connections

Note:

- For detailed Input Connection instructions, refer to section 4.5.1 and for GPS antenna, refer to section 4.5.1.4

2.5.18 OUTPUT Tile

The OSA 5548C SSU unit can be delivered with different types of output tile sets.

- Output tile with 20x Symmetrical outputs
- Output tile with 20x Asymmetrical outputs
- Output tile with 20x Asymmetrical outputs for Remote panel

Each Output Tile has 2 Output Groups (OG) of 10 Outputs Lines (OL). OG 1 supplies OL 1 to 10 and OG 2 supplies OL 11 to 20.

2.5.18.1 Output Tile with 20x CEI 1.0/2.3 connectors

20x ASYMMETRICAL with CEI 1.0/2.3 75ohms

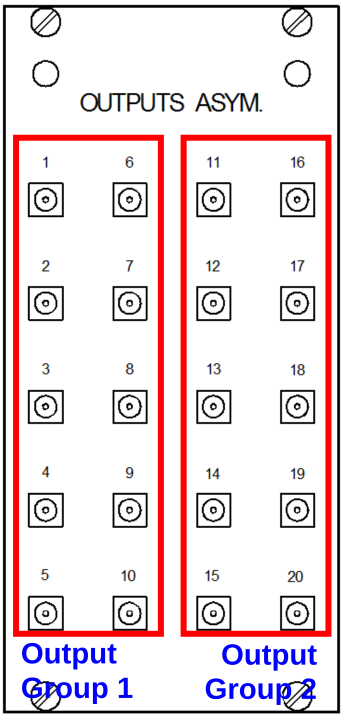
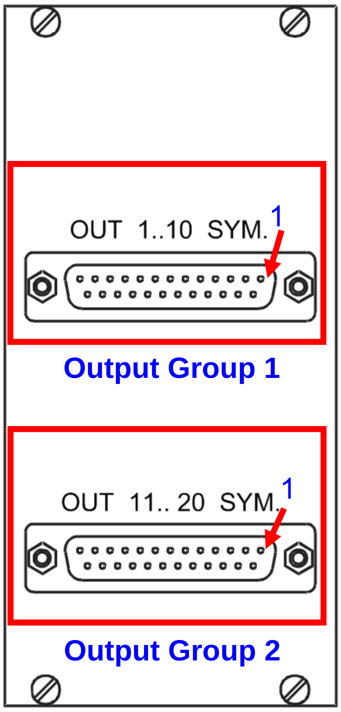


Figure 2-46 : ASYM CEI Output Connector Tile

2.5.18.2 20x Output Tile with SUB-D 25 pins

20x SYMMETRICAL with SUB-D 25 pins female 120 ohms



OL 1…10

OL	Tip	Ring	Shield
1	25	12	13
2	24	11	13
3	23	10	20
4	22	9	20
5	21	8	7
6	19	6	7
7	18	5	14
8	17	4	14
9	16	3	1
10	15	2	1

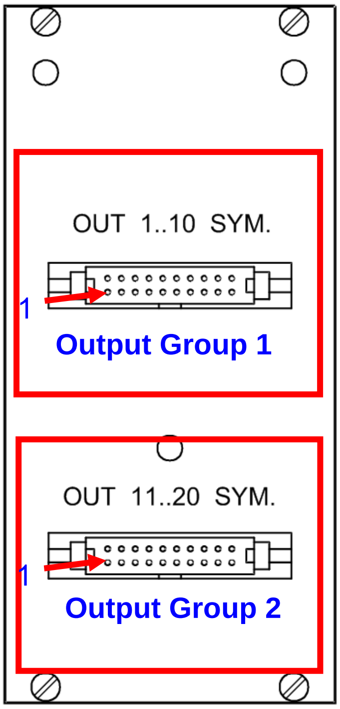
OL 11…20

OL	Tip	Ring	Shield
11	25	12	13
12	24	11	13
13	23	10	20
14	22	9	20
15	21	8	7
16	19	6	7
17	18	5	14
18	17	4	14
19	16	3	1
20	15	2	1

Figure 2-47 : SYM SUB-D Output Tile

2.5.18.3 20x Output Tile with IDC 20 pins

20x ASYM. with IDC connector for Remote BNC panel



OL 1…10

OL	Tip	Ring
1	1	2
2	3	4
3	5	6
4	7	8
5	9	10
6	11	12
7	13	14
8	15	16
9	17	18
10	19	20

OL 11…20

OL	Tip	Ring
1	1	2
2	3	4
3	5	6
4	7	8
5	9	10
6	11	12
7	13	14
8	15	16
9	17	18
10	19	20

Figure 2-48 : ASYM IDC Output Tile

2.5.19 Time Code Card - NTP Tile

1x NTP with RJ45 connector

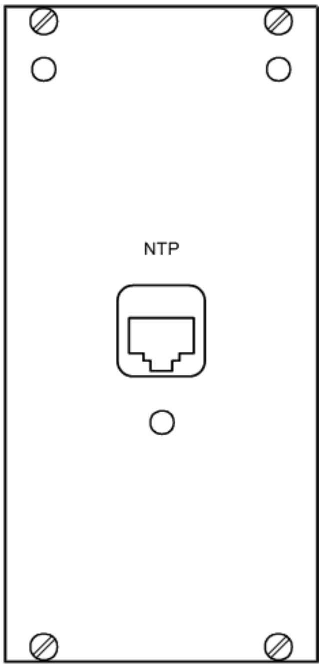
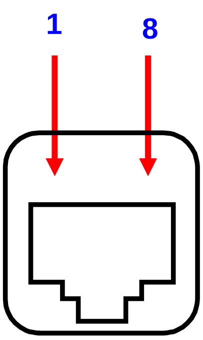


Figure 2-49 : TCC-NTP Output Tile

2.5.19.1 TCC-NTP Ethernet Port

This socket is a RJ-45 female type to connect Ethernet for remote management.



PIN	DESCRIPTION
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

Table 2-21 TCC-NTP Ethernet COMM Port Connector Description

2.5.20 100x BNC Output Ports Remote Panel

The BNC Remote Panel provides up to 60x BNC 75ohms Output Ports (ASYMM.). It can be installed anywhere in the same rack where the OSA 5548C SSU is mounted. For each 10 outputs of an Output Group (OG), a ribbon cable connected from an Output Tile for Remote panel (refer to Figure 2-46) to the corresponding Remote Panel output tile's connector is required.

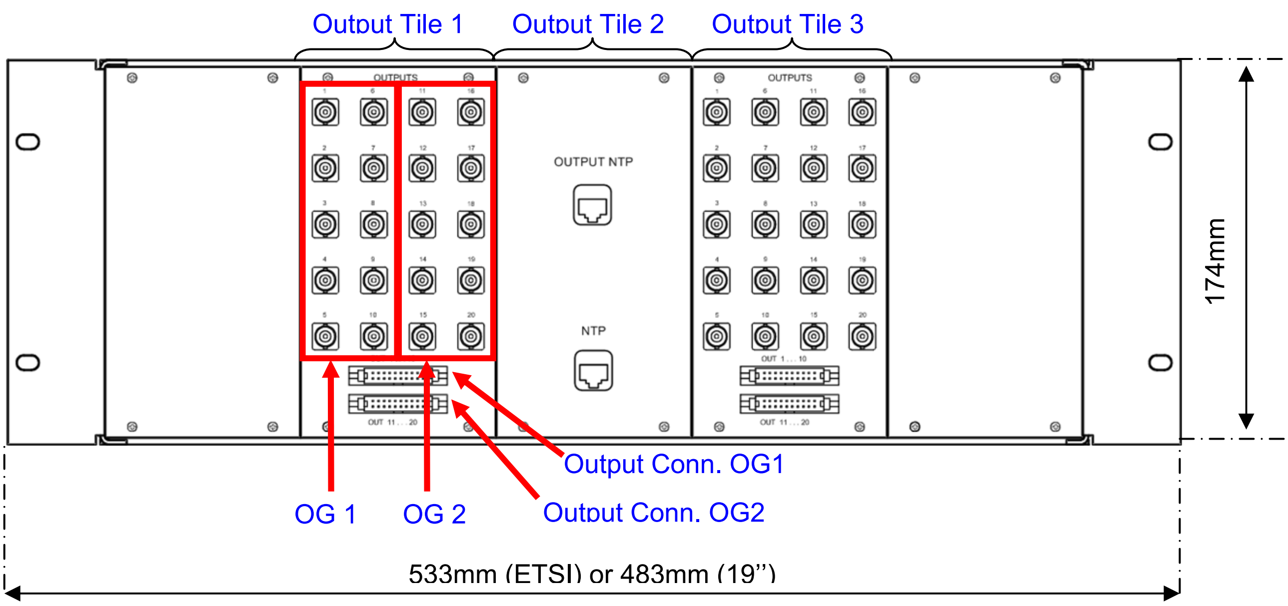


Figure 2-50 : Remote BNC panel - Front View

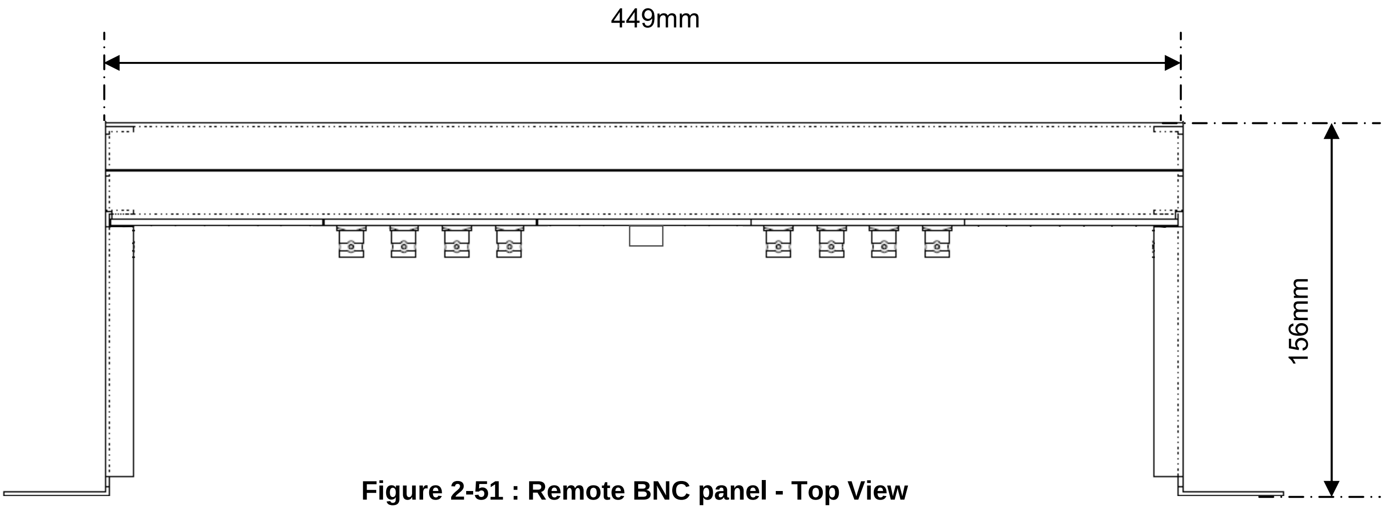


Figure 2-51 : Remote BNC panel - Top View

2.6 Communication

The OSA 5548C SSU includes Remote and Local Management capability.
On the OSA 5548C SSU, two serial ports allow the operator to access the system via RS-232. Both connectors (type: Sub-D 9p male, labeled: LOCAL comm.) are located on the front of the Power B card and on the Management Tile. There is also one RJ-45 port for management via Ethernet. The local interfaces operate on TL1 commands.

2.6.1 SyncView PLUS

A CD-ROM containing the *SyncView PLUS* management software is delivered with all OSA 5548C SSU. By default, the *SyncView PLUS* runs in *Element Manager* version, which allows the user to easily configure and manage an OSA 5548C SSU via serial connection (RS-232 – Null Modem) or via a peer-to-peer TCP/IP connection.

A license can be ordered to enhance the *SyncView PLUS Element Manager* as an *Element Manager PRO* version, which introduces Performance Measurements graphical user interface and storage capability for of up to 2000 alarms and events.

The *SyncView PLUS* software can also becoming a *Network Manager* version, which operates as a Central Network Managing System. Through the same software interface, it allows managing all OSA 5548C SSU equipments in a network, as well as others Oscilloquartz and third party equipments from any location via an Ethernet TCP/IP network. For full security and redundancy, Oscilloquartz offers also the *SyncView PLUS Network Manager Advanced* version in a reliable 19’’ rack mountable server, which enhances secure configurations, such as mirroring, RAID-5 disks and advanced SQL database. Other features can be requested to match your security needs.

Figure 2-52 and Figure 2-53 are examples of the Graphical User Interfaces, which can be seen locally and/or remotely through the *SyncView PLUS* Management Software. Figure 2-54 is the Network Browser view of the *SyncView PLUS Network Manager* version.

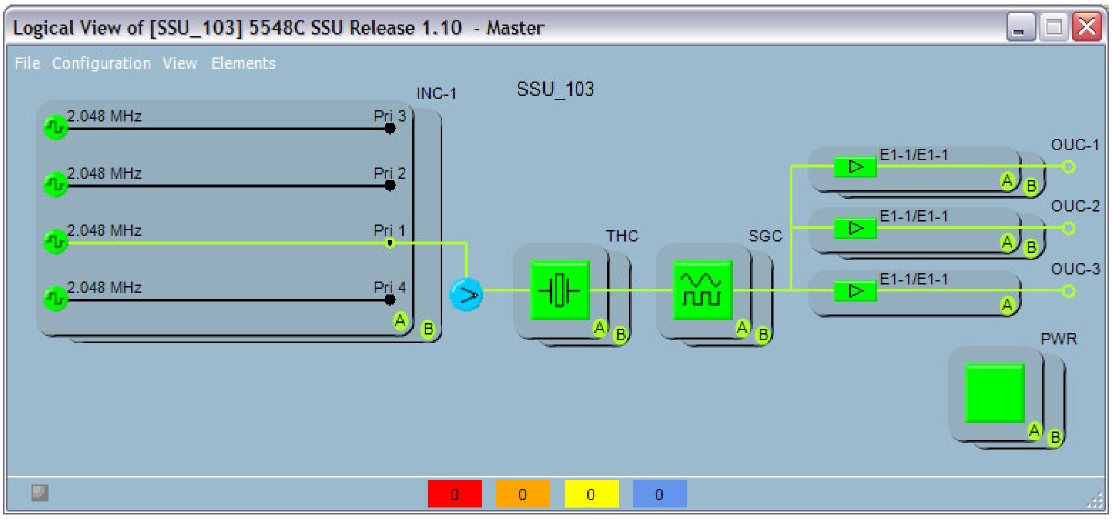


Figure 2-52 : *SyncView PLUS* - Logical View (example)

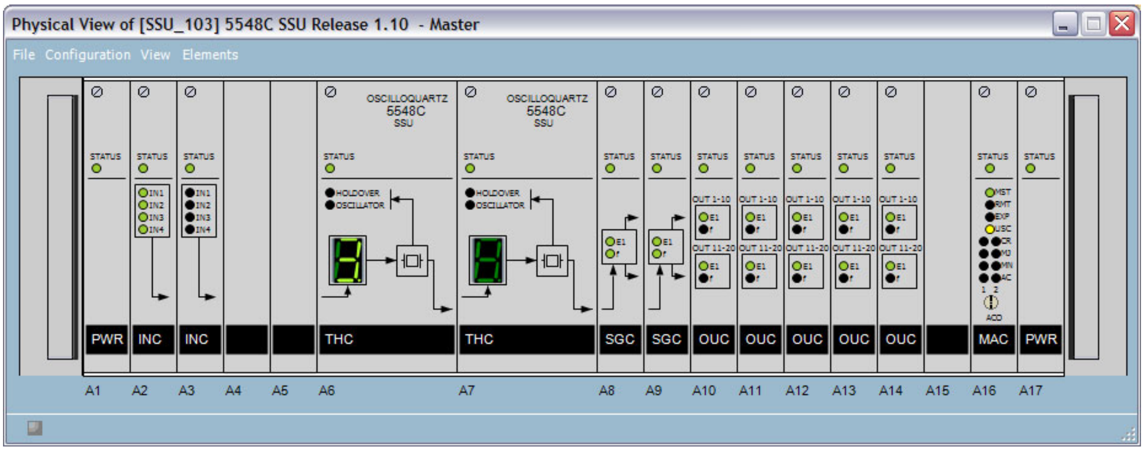


Figure 2-53 : *SyncView PLUS* - Physical View (example)

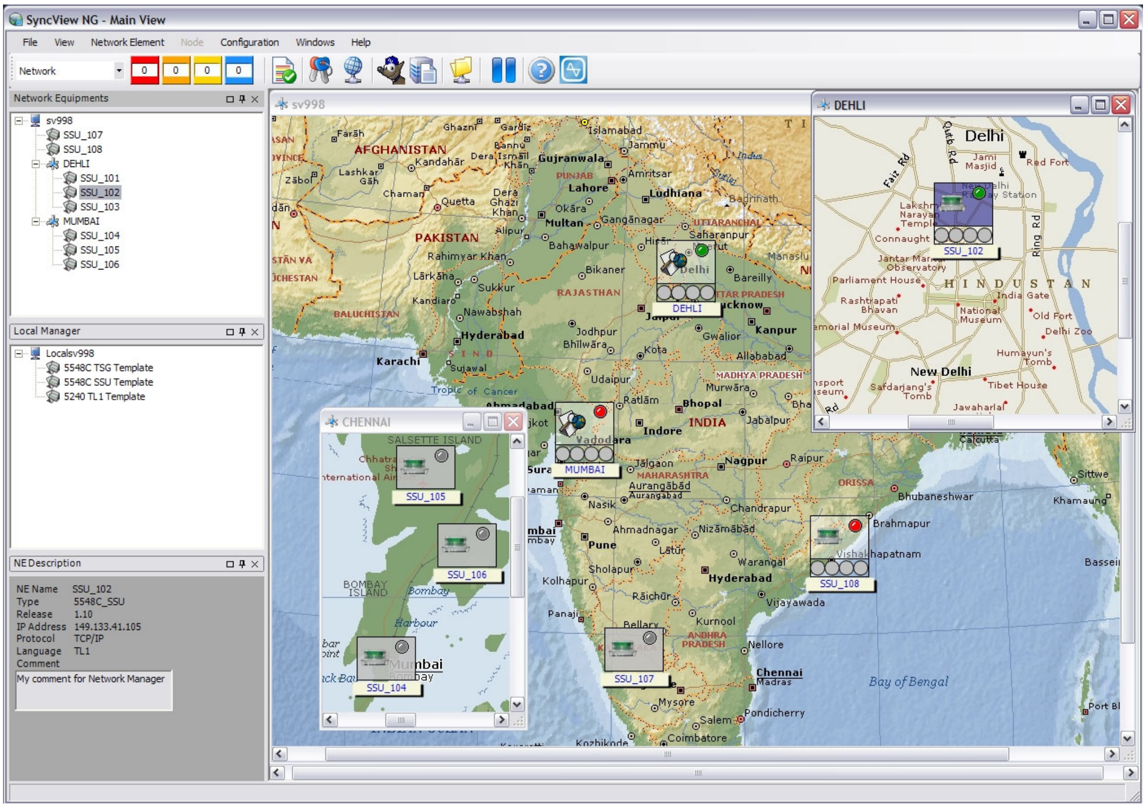


Figure 2-54 : *SyncView PLUS Network Manager* version – Synchronization Network General View (example)

2.6.2 SyncTerminal

The SyncTerminal is a terminal Interface enhanced with a TL1 tutor, which assists the user with the syntax of any TL1 command for the OSA 5548C SSU. The SyncTerminal can remotely access the shelf via TCP/IP on LAN COMM. port or locally via serial RS-232C on LOCAL COMM. port.

Key features:

- Sending TL1 commands via local serial RS-232 connector as well as remote Ethernet connection.
- SyncTerminal assists with the TL1 commands, and auto-completes the commands as the user types them
- All 5548C TL1 commands are provided in a tree-like menu or sorted by alphabetical order.
- Quickly repeats past commands very efficiently without retyping them.
- Sends user-preprogrammed TL1 commands scripts.
- Test an Ethernet connection with an embedded “PING” function.
- Ergonomical and customizable window interface.
- Command and response logging
- Interfaces to many Oscilloquartz products with MML or TL1

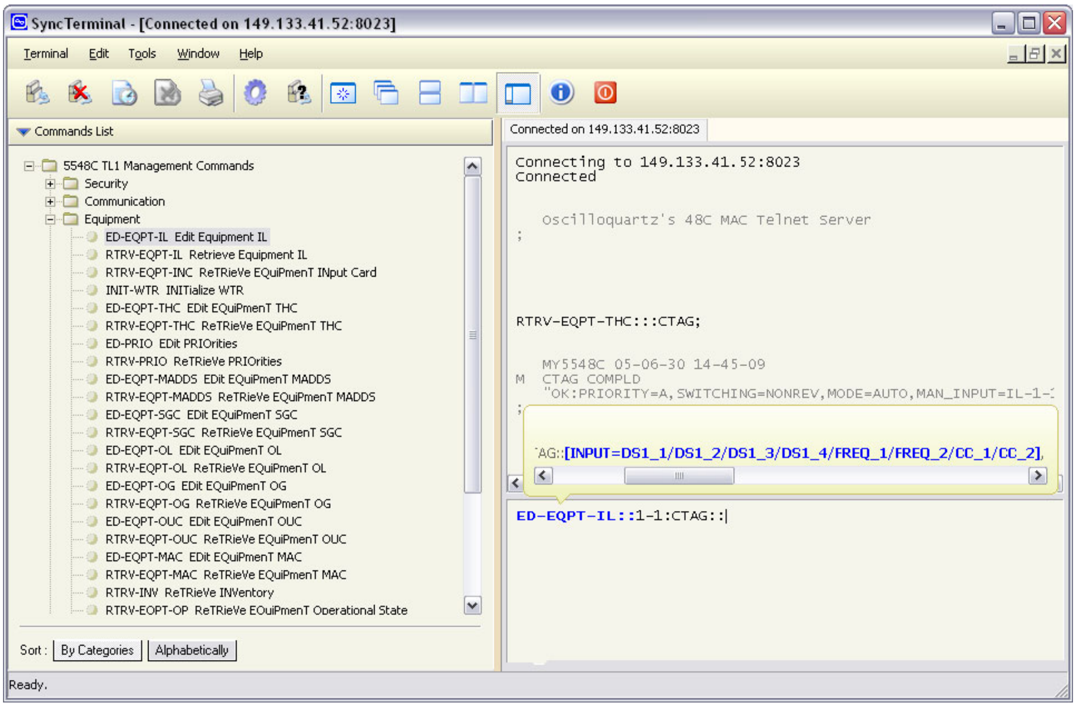


Figure 2-55 : SyncTerminal (example)

2.7 Synchronization Status Messaging (SSM)

E1 lines can carry Synchronization Status Messages (SSM), which is embedded information about the frequency quality level allowing any SSM compatible network element (NE), to select the best frequency quality according to the sync source.
The SSM status transfers synchronization quality from the active input or source, toward E1 outputs. The SSM byte is encoded on E1 signals.
The OSA 5548C SSU supports Synchronization Status Messaging (SSM) on input and output interfaces E1 (2.048 Mbit/s) according to ITU-T G.781 second generation SSM norms.

Here are the different SSM quality levels supported by the OSA 5548C SSU.

Level description	Quality Level	Abbreviation
G.811 Primary Reference Clock	1	PRC
G.812 Type I or V	2	SSU-A
G.812 Type IV	3	SSU-B
G.813 Equipment Clock Option I	4	SEC
Do Not Use for synchronization	5	DNU
SSM Failure	-	FAILED
SSM Quality unknown	-	UNKNOWN

Table 2-22 SSM Levels

2.7.1 SSM Inputs

The OSA 5548C SSU extracts the SSM information from each E1 input signal.

The operator can assign the SSM value for each individual input signal, if the input signal is not an E1 signal, or if it does not include the Synchronization Status Message.
The 5548C can read SSM on all the Sa bits according to the user configuration

2.7.2 SSM Input Selection

Based on the extracted Synchronization Status Message SSM Clock quality, or user defined level, the OSA 5548C SSU will automatically select the higher quality input reference signal.
In case two input signals include the same SSM Quality Level, the priority table levels are used to override selection of two similar SSM quality reference signals.
Should all input signals include SSM byte corresponding to a lower value than the internal oscillator, the OSA 5548C SSU will enter in holdover operation mode.

2.7.3 SSM Outputs

If activated, the OSA 5548C SSU generates E1 output signals including Synchronization Status Message.
In normal operation, the SSM output value corresponds to the reference input signal's SSM.

In holdover mode, the SSM byte corresponds to the quality level of the internal oscillator.

2.8 Alarms

Thanks to its LEDs, the OSA 5548C SSU indicates current alarms and status. Detailed alarms and events are reported to local or remote software such as SyncTerminal or SyncView PLUS.

The MAC card is the one that gathers stores and distributes alarms and events information and messages.

The shelf can accept alarms from external equipment, such as door or cooling system alarm contacts connected to the input alarm connector. The SSU provides alarm outputs to any other device.

A description of all physical alarms for each card is located in section 8.2.1 and an alarm and event list can be found in the **"Alarms List"** document.

The alarms are categorized in 3 levels, Critical, Major or Minor. Other events are also shown as Non-Alarmed condition.

The OSA 5548C SSU has also the capability to escalate the severity of an active alarm after a configurable delay (24 hours by default).

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Chapter

3. Pre-Installation Considerations

Including:

- Overview
- Site Survey
- ElectroMagnetic Interference (EMI) Prevention
- Rack Preparation
- GPS Antenna Mounting

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3.1 Overview

This chapter provides guidelines and requirements needed before ordering and installing the OSA 5548C SSU. It is divided into the following sections:

- **Site survey** section provides instructions before installing the OSA 5548C SSU.
- **Rack preparation** section, presents the size of the shelf and power cable requirements.
- **GPS Antenna Mounting** (referral to separate installation guide), describes how to mount and cable the GPS antennas in order to prepare the connection to the OSA 5548C
- **Remote communication** section, describes the information required to configure the OSA 5548C SSU, to be remotely manageable.
- **Required Tools and Material** consists of a list presenting the basic tools and instruments necessary to install and configure the OSA 5548C SSU.

Note:

Installation & cabling instructions are presented in chapter 4.

3.2 Site Survey

Plan the following prior installing the OSA 5548C:

- A location as far as possible from any sources of electrical noise.
- Power supply with dual -48 VDC with breakers
- Battery Distribution Fuse Bay (BDFB) maximum rating: 10A
- Ground connection
- For environmental specifications please refer to the chapter 9.

3.3 ElectroMagnetic Interference (EMI) Prevention

Electromagnetic interferences (EMI) from any equipment can affect the normal operation of other equipments. To prevent such interferences with other equipments, the OSA 5548C must be installed as per described below.

All cables connected to the OSA 5548C should be shielded cables with “drain” wires connected to the rack ground.

Follow your company procedures for shield grounding. The screws on all cable connectors must be correctly fastened to their corresponding connectors.
During 5548C operation, there must be a card or blank panel installed in every slot and tile position. The locking screws on every card and tile should be correctly tightened.

On GPS antenna BNC connector where no GPS antenna cable is connected to, a BNC caps must be mounted on.

CAUTION

Use only shielded cabling on all telecom signals wiring, including input, output, management and Ethernet connections.

Ensure that connections are properly grounded.

3.4 Rack Preparation

3.4.1 Shelf Preparation

Consider the following size to install the OSA 5548C SSU-E60.

Vertical rack size:	26.6 cm (10.5 inches) 6U
Depth rack size:	24.60 cm (9.7 inches)
Width rack size:	53.3 cm (21 inches) ETSI
	or 48.26 cm (19.0 inches) 19”

Note:

The shelf can be configured in ETSI or 19’’ width by turning the laterals mounting ears by 90°.

Consider 4 screws to tighten the shelf using the 2 holes in each the mounting ears.

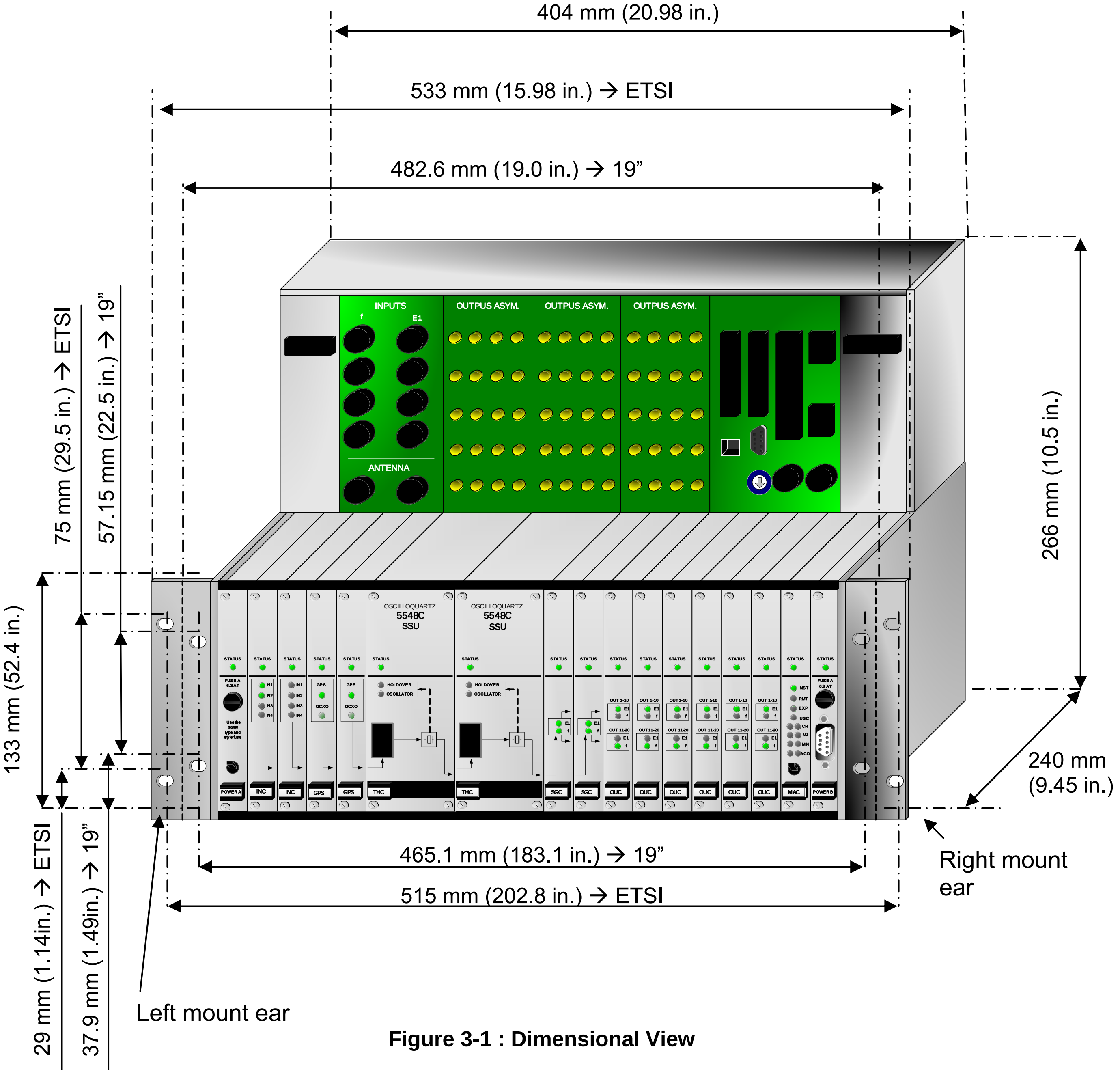

Figure 3-1 : Dimensional View

CAUTION

Each OSA 5548C SSU must have at least 1 RU (4.5 cm) of clearance below to assure sufficient cooling.

3.4.2 Remote Panel Preparation

The BNC Remote panel can be installed anywhere in the same Rack of the shelf.

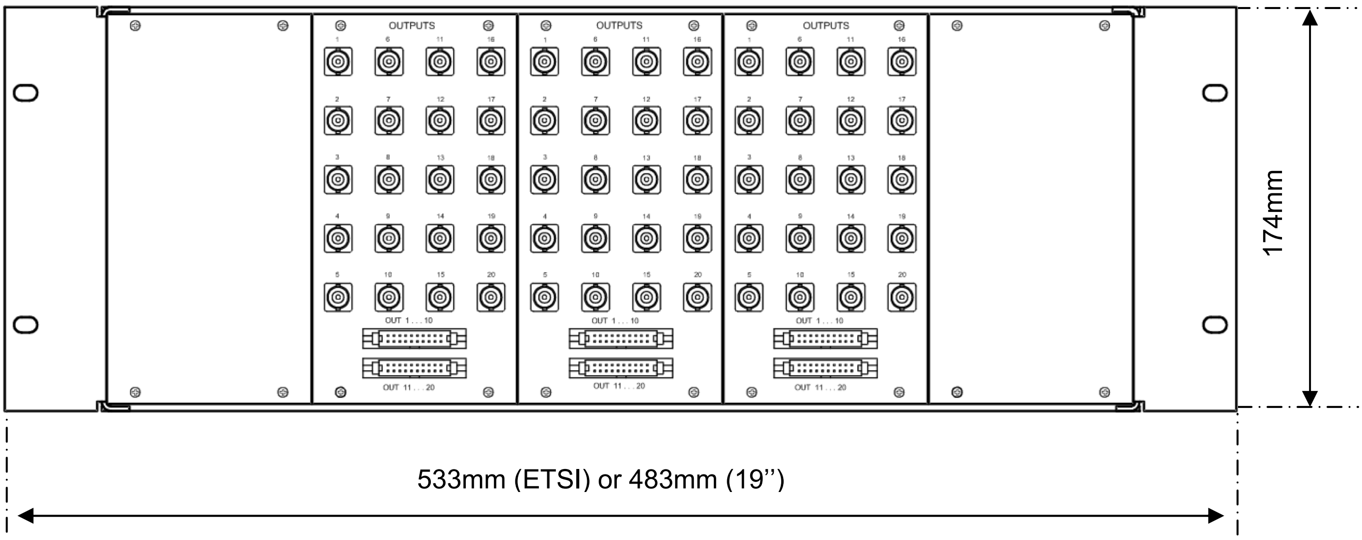

Figure 3-2 : Remote BNC panel - Front View

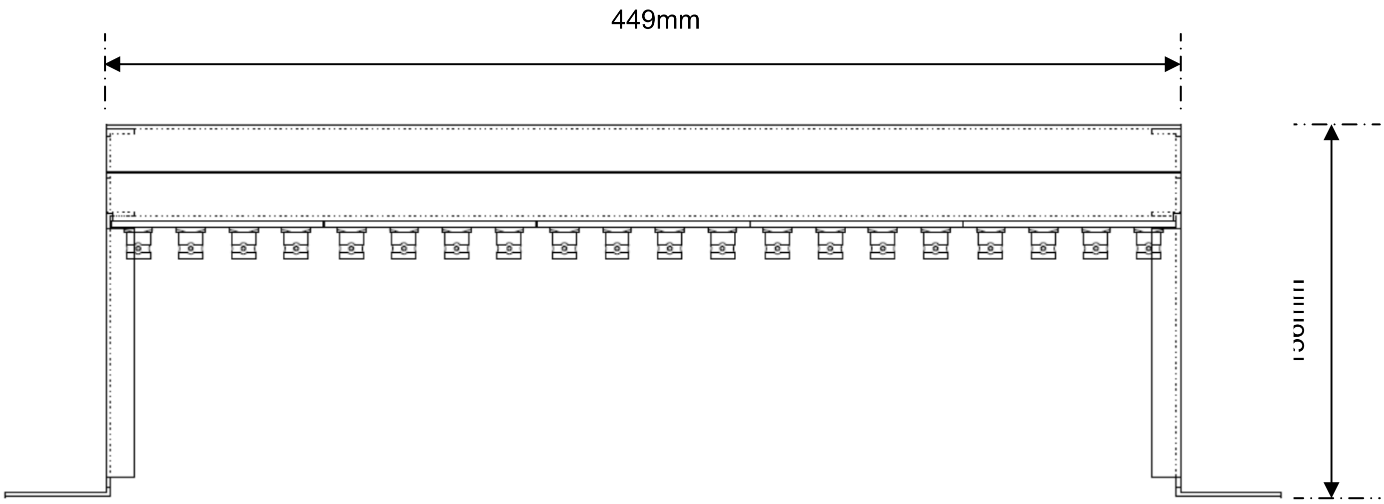

Figure 3-3 : Remote BNC panel - Top View

3.4.3 Power supply cables

CAUTION

Power voltage must be between 40VDC minimum and 60VDC maximum.

- **DC power supply:** recommended minimum cable size: $2mm^2$
- **Ground:** recommended minimum cable size: $2mm^2$

3.5 GPS Antenna Mounting

Please refer to the **"GNSS Antenna & Accessories Installation Guide"** For detailed information concerning the necessary precaution to undertake.

CAUTION

The installation guide must be carefully read prior connecting GPS antenna cable and antenna to the OSA 5548C.

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Chapter

4. Equipment Installation

Including:

- Overview
- Unpacking
- Rack Mounting
- Grounding & Power Connection
- Connections
- Alarms
- Cabling Communication Ports
- Installation Check List

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4.1 Overview

Recommendation:

The "Pre-Installation Considerations" chapter must be carefully read prior to this chapter.

Note:

Turn-up and configuration procedures are described in chapter 6 of this document.

This chapter covers detailed installation instructions for the OSA 5548C SSU. It is divided into the following sections.

- **Unpacking** section, describes the precautions and instructions required to unpacking and inspecting the OSA 5548C SSU and its associated material.
- **Rack mounting** section, presents the size and information for mounting the rack.
- **Grounding and power connection** section, explains how to connect the power and ground to the OSA 5548C SSU.
- **Connections** section, describes how to cable the Input and Output connections.
- **Alarms** section, describes how to connect the remote and local alarm cables and a typical application.
- **Local/Remote connections** section, describes how to connect a 5548C extension shelf.
- **Cabling communication ports** section, explains cabling to connect a local and/or remote management system.

If any difficulties are encountered during the installation process, contact your local OSCILLOQUARTZ representative or OSCILLOQUARTZ offices.

4.2 Unpacking

CAUTION

Check first that the packing does not have any signs of rough handling such as dents or scratches, which might have occurred during transportation. Also inspect the equipment carefully for possible damage (broken knobs, bent handles, etc.).

Should the equipment have suffered any damage, immediately notify the carrier and retain the packing material for inspection.

Recommendation:

We recommend saving the packing material for use in case of return shipment. Should you need to return the equipment, please do not hesitate to contact OSCILLOQUARTZ for help in obtaining appropriate packing material.

CAUTION

When handling the OSA 5548C SSU unit or spare cards, the operator must use grounded wrist straps.

CAUTION

Spare cards must be stored in anti-static packaging.

Note:

Compare the OSA 5548C SSU contents with the purchase order / order acknowledgement. In case of error, contact your local OSCILLOQUARTZ representative or OSCILLOQUARTZ offices.

4.3 Rack Mounting

An installed OSA 5548C SSU-E60 occupies the following space in the rack. Also see Figure 4-2.

Vertical rack size:	26.6 cm (10.5 inches) 6U
Depth rack size:	24.60 cm (9.7 inches)
Width rack size:	53.3 cm (21 inches) ETSI
	or 48.26 cm (19.0 inches) 19”

Refer to picture Figure 3-1 for more details about dimension.

CAUTION

Each OSA 5548C SSU must have at least 1 RU (1.75in. / 4.5 mm) below the shelf to allow for adequate convection cooling.

4.3.1 Configuring the Shelf Width as ETSI or 19’’

Verify that the two lateral ears of the shelf are mounted in the corresponding size (ETSI or 19”). When the size is not correct follow the below procedure:

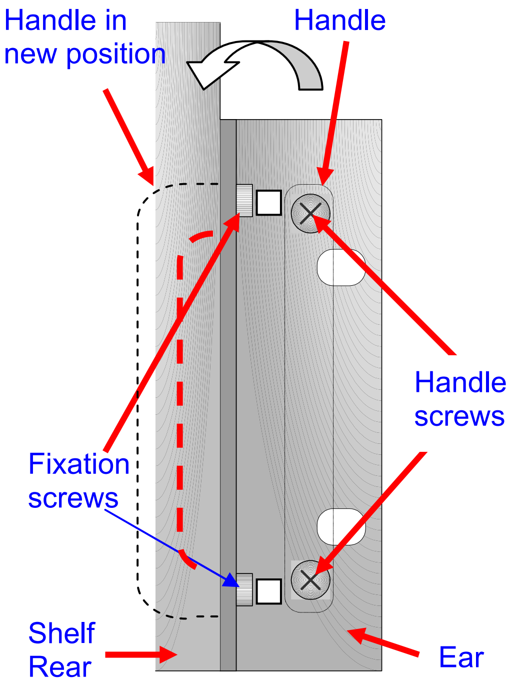


Figure 4-1 : Rear View of Lateral Ear

STEP	ACTION
1	Unscrew the fixation screws of the 2 ears
2	Unscrew the Handle screws
3	Move the handles on the perpendicular side of the ears as per shown on Figure 4-1
4	Tighten the handles with the screws previously utilized.
5	Apply the ears on the lateral sides of the shelf in order that the handles point on the front
6	Tighten the ears with the two screws previously utilized.
7	Ensure that ears and handles are solidly fixed

4.3.2 Mounting the Shelf in the Rack

STEP	ACTION
1	Check the position in which to fit the shelf in the rack
2	Mount the OSA 5548C SSU carefully onto the rack rails from the front of the rack and fix it using four screws and their corresponding washers.

Procedure 4-1 Rack Mounting

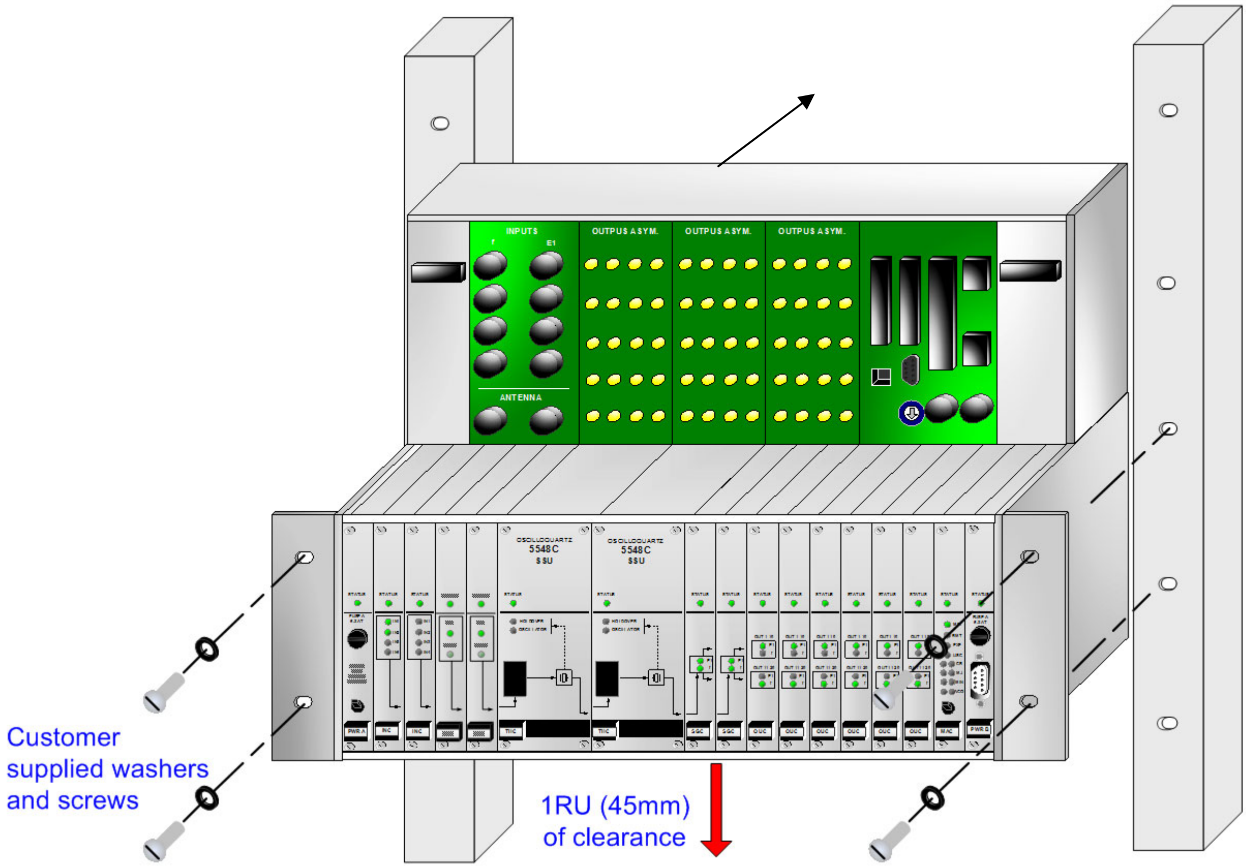


Figure 4-2 : Rack Mounting

4.3.3 Remote Output Panel Mounting

It is recommended to mount the Remote Panel once the OSA 5548C SSU is mounted. It is possible to mount the panel above or below the shelf, leaving enough space (at least 1 RU) for cable and adequate convection cooling.

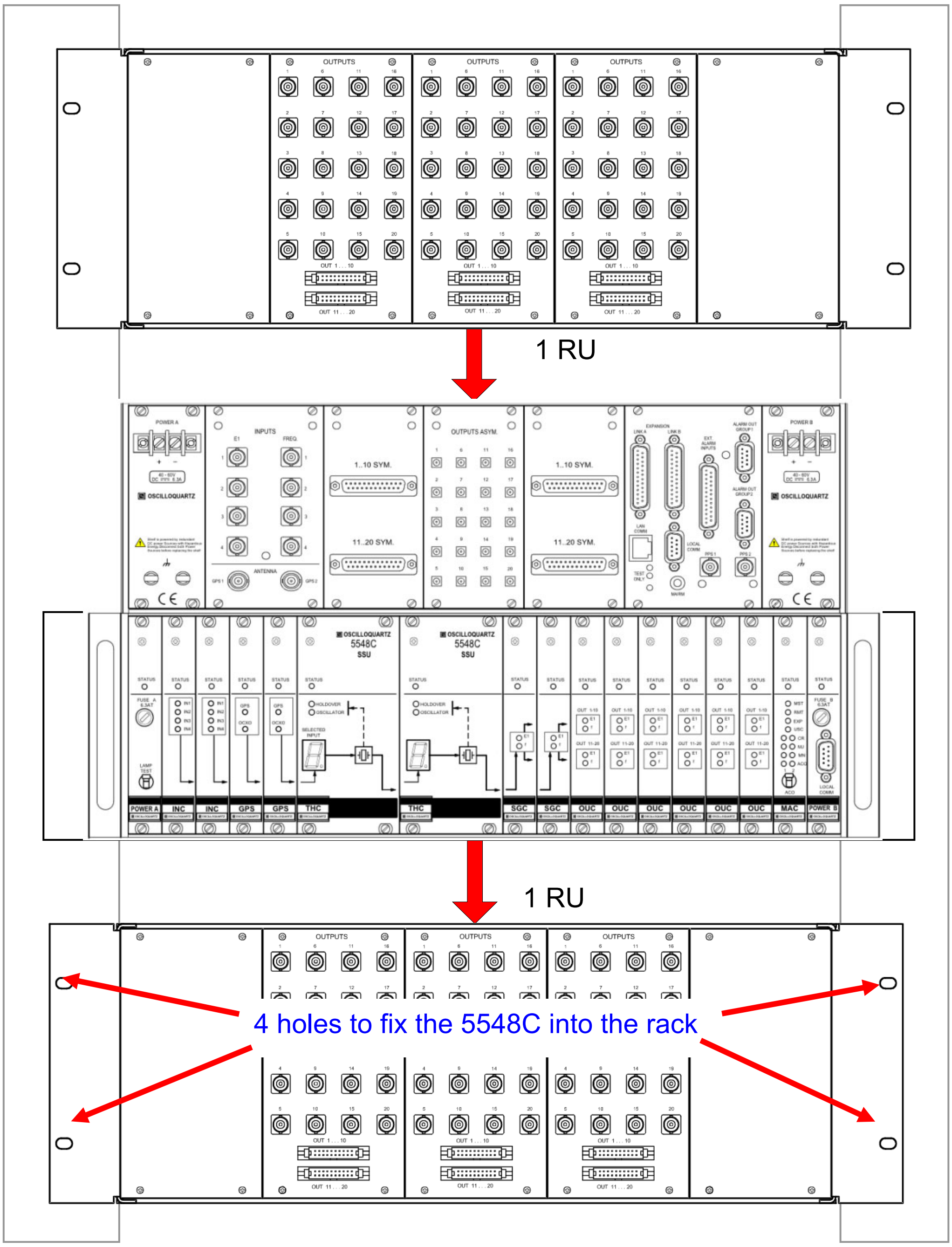


Figure 4-3: Mounting Remote Output Panel in the rack

Note:

- The Remote Panel can be adjusted in 19” or ETSI according to the rack type.
- The Remote Panel can also get its output connectors pointing on the rear of the rack

STEP	ACTION
1	Check the position in which to fit the shelf in the rack. Intsall under or above the shelf eaving a space of 1 RU (4.6cm).
2	Mount Remote Panel carefully onto the rack using four screws and their corresponding washers (customer-supplied).
3	Read section 4.5.2.4 for cable connection between 5548C’s output tiles and the Remote Panel

Procedure 4-2 Remote Panel Mounting

4.4 Grounding & Power Connection

The OSA 5548C SSU has redundant -48VDC power input connectors called POWER A and POWER B, which supply power to each individual card slot.
The POWER A connection tile is the tile A21 and the POWER B is the tile A27.

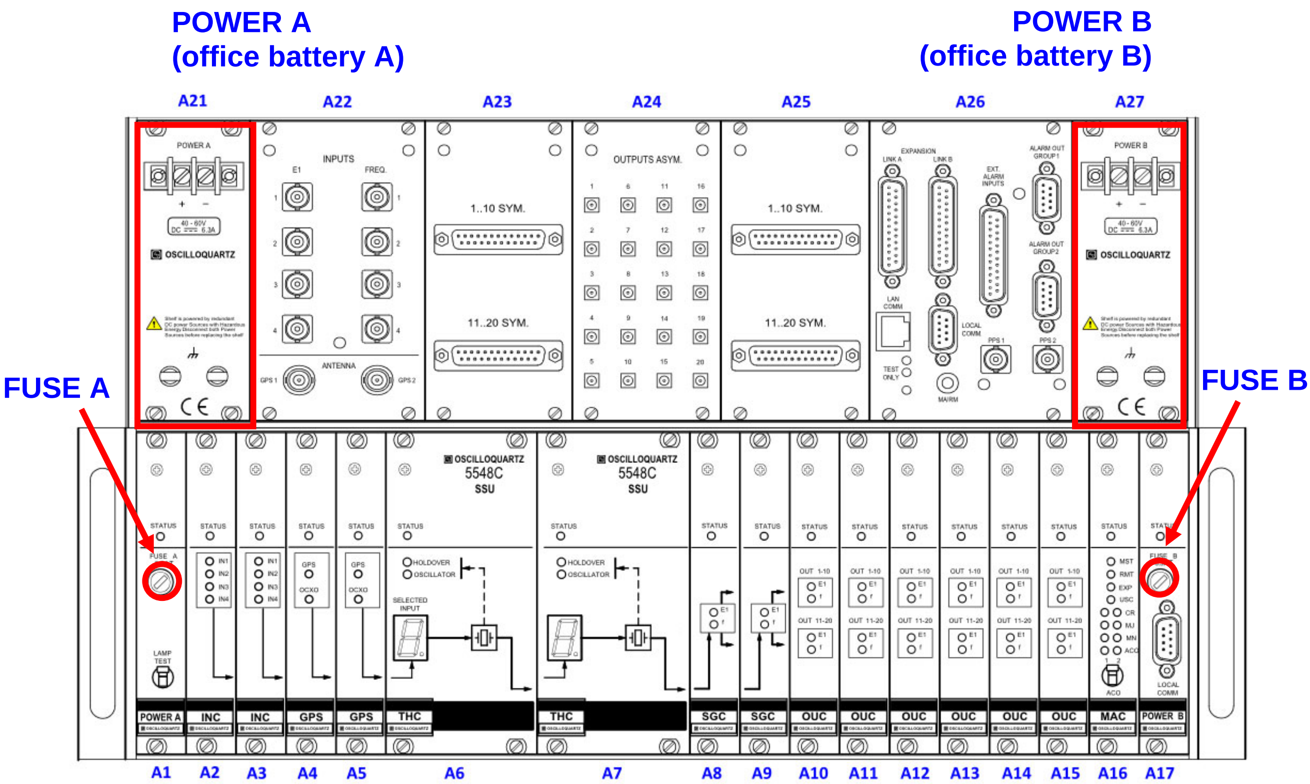


Figure 4-4 : Power Tile & Fuse Location

The fuses of the shelf are located on both POWER A and B cards.

CAUTION

Do not exchange POWER A & POWER B cards in their respective slots.
This may cause damage and inhibit the correct functioning of the shelf.

Note:

The fuse specification is T 6.3A L 250V – 5mm x 20 mm size
DC Inputs are isolated from shelf and logic ground.

In order to ensure correct powering-up of the system, it is necessary to follow these instructions.

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>1</td><td>The unit should be installed near the socket outlet, which must be easily accessible.</td></tr>
<tr><td>2</td><td>The shelf must be connected to a proper earth:
a. The ground connections of the shelf are made using the studs of the rear power tiles, as shown in Figure 4-5.
b. Connect the OSA 5548C SSU to the earth using cable min. 2mm²
c. Verify that no voltage exists between the ground and the shelf, using a voltmeter
Recommendation: Make this cable as short as possible.</td></tr>
<tr><td>3</td><td><u>Remove the fuses located on the POWER A and the POWER B cards</u> front panel (Slots A1 & A 17) using a flathead screwdriver. They will be reinstalled in the power-up procedure in chapter 5</td></tr>
<tr><td>4</td><td>Locate the power tiles on top range of the shelf, respectively A21 for POWER A and A27 for POWER B.</td></tr>
<tr><td>5</td><td>Remove (if necessary) the transparent plastic protection above the power connector on each Power tiles using a screwdriver.</td></tr>
<tr><td>6</td><td>The minimum conductor size of the power cord must be at least 2mm².
Connect primary power to the connectors on the POWER A tile and secondary power on the POWER B tile as shown in Figure 4-5.
Recommendation: use a spade lug termination for each power wire</td></tr>
<tr><td>7</td><td>Measure voltages and polarities of the external power sources before connecting them to the OSA 5548C.
The voltages must be within the specified ranges (40 to 60VDC).</td></tr>
<tr><td>8</td><td>To ensure that the power connections to the 5548C are correct, use the following procedure:
1. Disconnect the –48V (-) wires from the POWER A & B tiles and leave the Return battery (+) connected.
2. On the power tile, use a Multimeter to measure the voltage between the following points:
<table>
<tr><th>TEST POINT 1</th><th>TEST POINT 2</th><th>VALUE</th><th>OK</th></tr>
<tr><td>POWER A -</td><td>POWER B -</td><td>0V</td><td>☐</td></tr>
<tr><td>POWER A -</td><td>POWER A +</td><td>0V</td><td>☐</td></tr>
<tr><td>POWER A -</td><td>GROUND</td><td>0V</td><td>☐</td></tr>
<tr><td>POWER B -</td><td>POWER B +</td><td>0V</td><td>☐</td></tr>
<tr><td>POWER B -</td><td>GROUND</td><td>0V</td><td>☐</td></tr>
</table>
3. Reconnect the –48V wires on to the POWER A and B – connectors
4. Measure the following points:
<table>
<tr><th>TEST POINT 1</th><th>TEST POINT 2</th><th>VALUE</th><th>OK</th></tr>
<tr><td>POWER A -</td><td>POWER A +</td><td>-40 to -60VDC</td><td>☐</td></tr>
<tr><td>POWER B -</td><td>POWER B +</td><td>-40 to -60VDC</td><td>☐</td></tr>
</table>
</td></tr>
</table>

STEP	ACTION
9	Replace the plastic protection on the power connector of both Power Tiles
10	**Please refer to chapter 5 for Turn Up Procedures**

Procedure 4-3 Grounding & Power connection

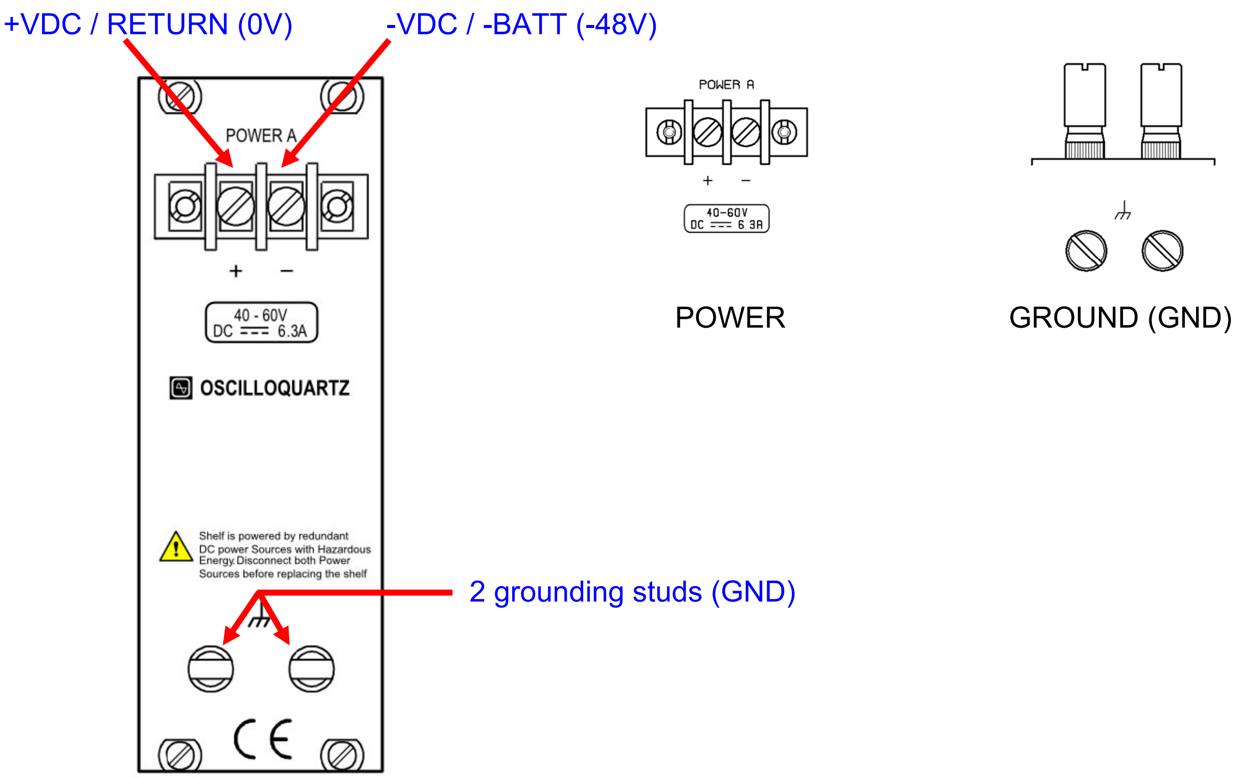


Figure 4-5 : Grounding & Power Connections on Power Tiles

Note:

Screw the studs to ensure grounding

4.5 Connections

4.5.1 Input and GPS Connectors

There is a group of INC (slots A2 and A3) and a group of GPS (slots A4 and A5) on the bottom range of the OSA 5548C SSU. The input tile is located on the top range of the OSA 5548C SSU (position A22).

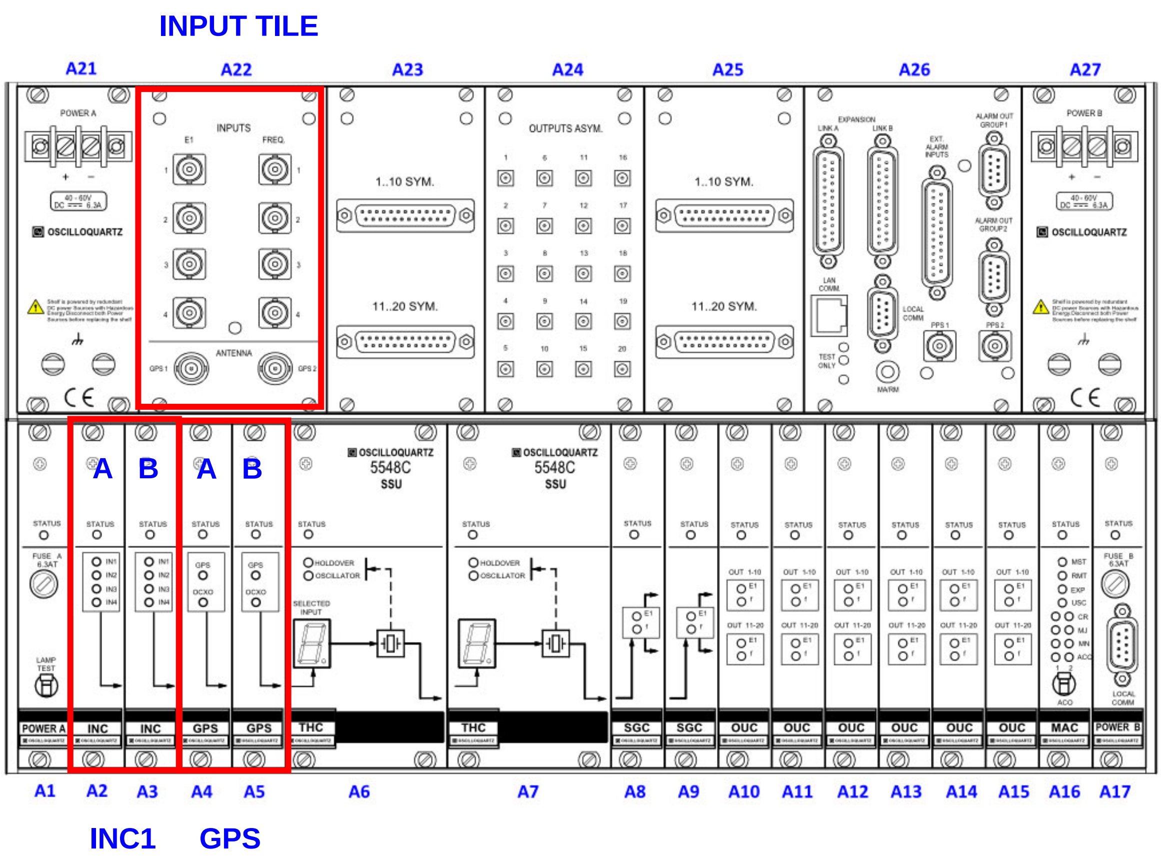


Figure 4-6: Input Cards and Tiles Location

The input connectors are processed by the INC group (slots A2 & A3).

The INC group can qualify or monitor up to 4 input lines (IL) among the 8 input connectors available (4x E1 and 4x Freq).

- E1 connectors can be cabled with asymmetrical E1 signal (2.048 Mbits at 75 ohms) or symmetrical with a 120/75 ohms adapter (balun).
- Freq connectors can be cabled with asymmetrical 2.048, 5 & 10 MHz sine or square wave frequency (75 ohms).

Note:

The Input Connectors to the Input Lines assignments and configurations have to be configured via TL1 commands. Refer to section 6.5.

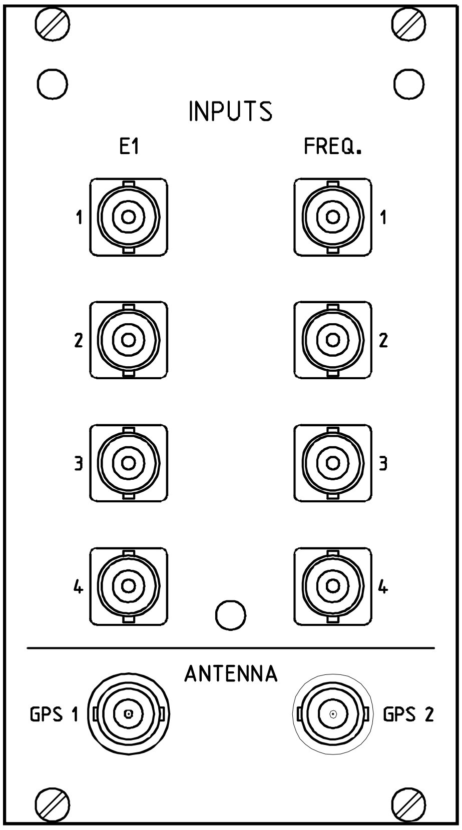


Figure 4-7 : Input Tile - Group location

Input Group INC A – INC B	
Input type to connector:	
Type	**Nr.**
E1	1
E1	2
E1	3
E1	4
FREQ	1
FREQ	2
FREQ	3
FREQ	4

Table 4-1 Input Groups

GPS A	**GPS B**
Antenna GPS 1	Antenna GPS 2

4.5.1.1 Introduction to Cable Input Ports

Connect the frequency inputs (i.e. from a PRS) to the Freq. BNC connector shown on Figure 4-7 with a 75 ohms asymmetrical coaxial cable.

Connect the E1 input either directly to the BNC connector for the asymmetrical 75 ohms option or through a 120/75 ohms adapter (Balun) for the symmetrical 120 ohms option.

Note:

Contact Oscilloquartz or your local representative for ordering BALUN.

The GPS antenna cable has to be connected on the BNC GPS inputs detailed in Figure 4-7.

Note:

Refer to section 9.2 for input signal specifications

4.5.1.2 Cabling a Frequency of 2.048, 5 or 10 MHz

STEP	ACTION
1	Select a connector of your choice among the 4 BNC connectors under the label “FREQ.”.
2	Use a coaxial cable 75 ohms with BNC male termination and connect it into the intended connector.
3	Check that the cable is tightened correctly into the BNC connector.

Procedure 4-4 Cabling a Frequency Input Connector

4.5.1.3 Cabling an E1 Input Connector

STEP	ACTION
1	Select a connector of your choice among the 4 BNC connectors under the label “E1”.
2	Use a coaxial cable 75 ohms with BNC male termination and connect it into the intended connector. Should you have a 120 ohms symmetrical cable, use a 120/75 ohm adapter (balun).
3	Check that the cable is tightened correctly into the BNC connector or onto the BALUN when used

Procedure 4-5 Cabling an E1 Input Connector

4.5.1.4 Cabling GPS Antenna

This section describes the procedure to connect the antenna cable(s) to the 5548C.

IMPORTANT*:*

The installation guide must be carefully read prior connecting GPS antenna cable and antenna to the OSA 5548C

STEP	ACTION
1	When cabling a roof or wall antenna, verify that the EMP protector is correctly mounted with reliable earth grounding.
2	Select a connector of your choice among the 2 BNC connectors GPS1 and GPS 2.
3	Connect the Coaxial cable into the intended connector.
4	Check that the cable is tightened correctly into the BNC connector.

Procedure 4-6 Cabling a GPS Input Connector

4.5.2 Output Connectors

4.5.2.1 Output Cards & Tiles

Up to 3 Groups of OUtput Cards (OUC) can be inserted in the OSA 5548C SSU (slots OUC1: slots A10 and A11; OUC2: slots A12 and A13; OUC3: slots A14 and A15), providing up to 60 output signals. Within each GROUP, there is an OUC A on which an OUC B can be added on the right slot to insure a one for one protection (1:1 redundancy).

The related Output Tiles are located in the same sequence on the top range of the shelf (OUC 1 tile: position A23; OUC 2: position A24; OUC 3: position A25).

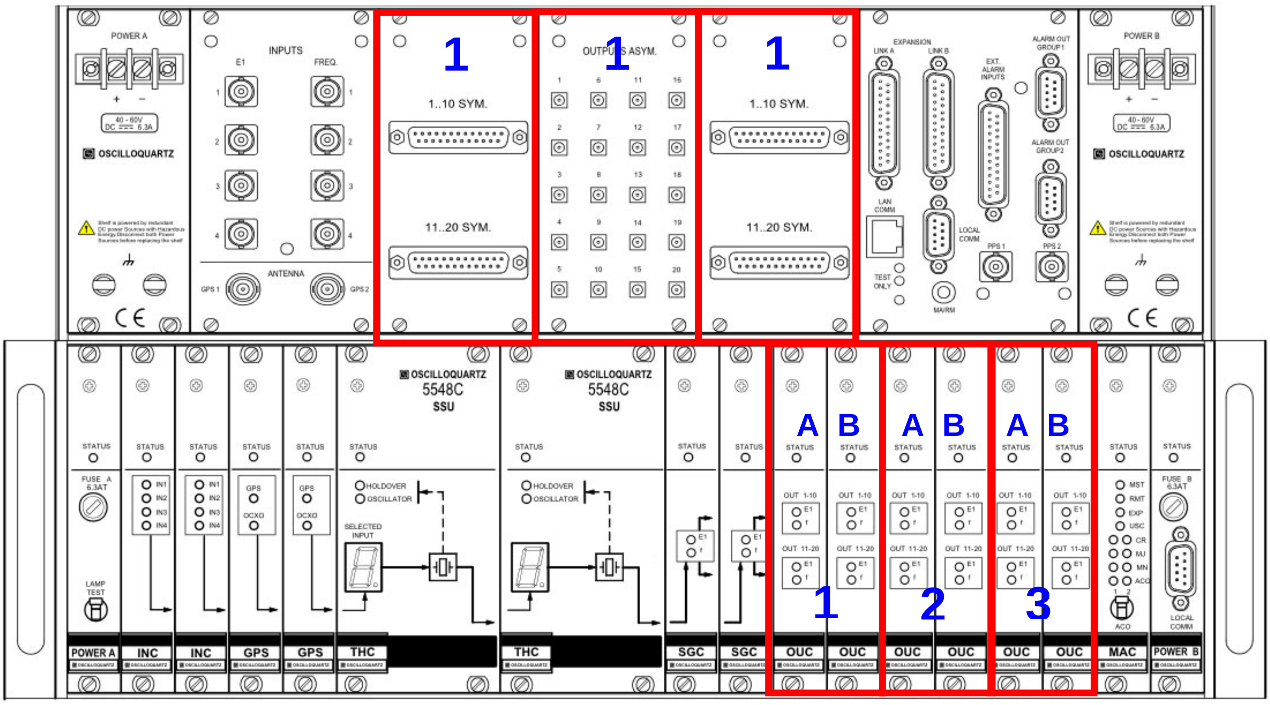


Figure 4-8 : OUC Groups & Tiles Location

GROUP	OUC A slot no.	OUC B slot no.	Output Tile
1	A10	A11	A23
2	A12	A13	A24
3	A14	A15	A25

Table 4-2 Output Slot Configurations

Outputs terminations

If outputs have impedance mismatch, output failure alarms could appear. Make sure the output ports are terminated with their corresponding loads or squelched (if not used) to avoid these false output failure alarms.

The sections below present different available types of Output tiles with their procedure of connection. Each tile provides twenty outputs signals, either Symmetrical or Asymmetrical.

Note:

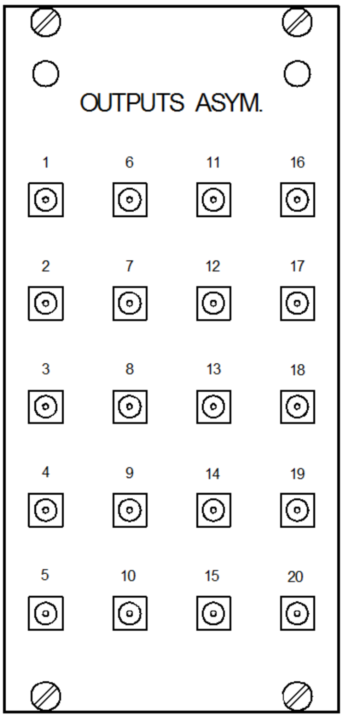
The maximal cable length from the output port of the 5548C to another device depends on the cable used.

To calculate the maximal length, use the following information:

- the output signal level specification from the section 9.5
- the manufacturer's cable "loss per meter" specifications at the frequency used (i.e. 2.048MHz)
- the minimum signal level allowed by the device to synchronise

4.5.2.2 Cabling Output Tile with 20x CEI 1.0/2.3 connectors

20x ASYMMETRICAL with CEI 1.0/2.3 75 ohms

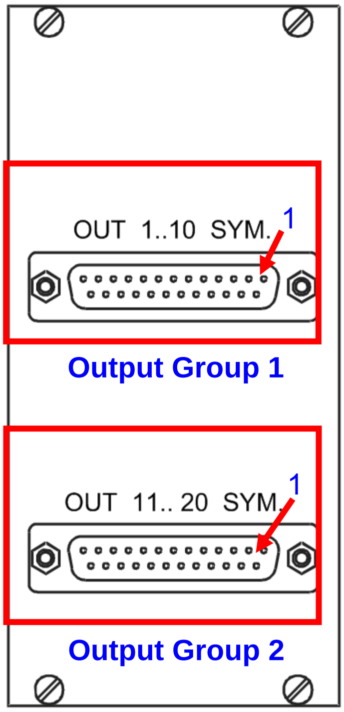


STEP	ACTION
1	Locate the connector tile corresponding to the group required to cable. Refer to the 5548C drawings on Figure 4-8 : OUC Groups & Tiles Location for card and connector tiles slot references
2	Select a connector, which will be configured with the signal desired. The output port configuration is done by software as described in section 6.9
3	Use a 75 ohms coaxial cable with CEI 1.0/2.3 male connector.
4	Plug the connector and ensure that it is correctly fixed.

Procedure 4-7 Cabling an E1 or Freq. port from an Asym. Output Tile with CEI connectors

4.5.2.3 Cabling Output Tile with 20x SUB-D 25 pins

20x SYMMETRICAL with SUB-D 25 pins female 120 ohms



OL 1…10

OL	Tip	Ring	Shield
1	25	12	13
2	24	11	13
3	23	10	20
4	22	9	20
5	21	8	7
6	19	6	7
7	18	5	14
8	17	4	14
9	16	3	1
10	15	2	1

OL 11…20

OL	Tip	Ring	Shield
11	25	12	13
12	24	11	13
13	23	10	20
14	22	9	20
15	21	8	7
16	19	6	7
17	18	5	14
18	17	4	14
19	16	3	1
20	15	2	1

Note:

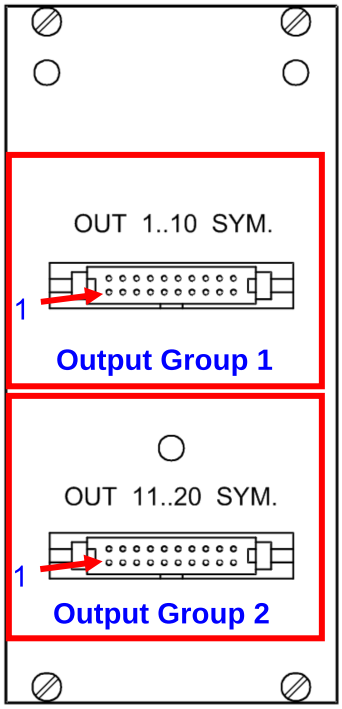
Any shield pins can be connected with any Output Line

STEP	ACTION
1	Locate the connector tile corresponding to the group required to cable. Refer to the 5548C drawings on Figure 4-8 : OUC Groups & Tiles Location for card and connector tiles slot references
2	Select a connector, which will be configured with the signal desired. The output port configuration is done by software as described in section 6.9
3	Use a SUB-D male connector with 25 pins with a ribbon cable connected on the pins described on the above table
4	Plug the connector and tighten it correctly.

Procedure 4-8 Cabling Output port from Output Tile with SUB-D 25pins connectors

4.5.2.4 Cabling BNC Output Port Remote Panel

20xASYM. with IDC connector for Remote BNC panel

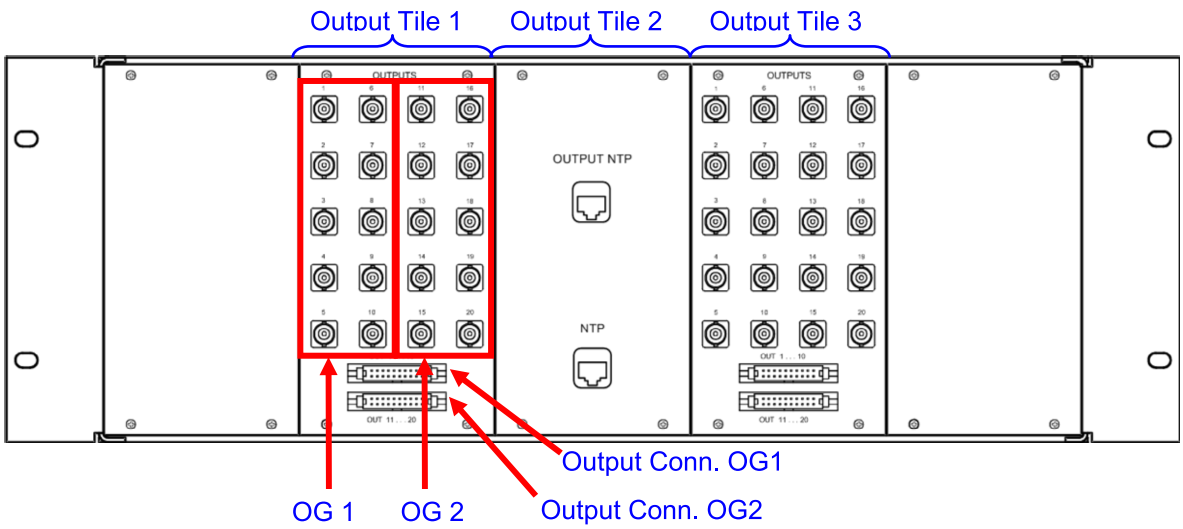


OL 1…10

OL	Tip	Shield
1	1	1
2	3	2
3	5	3
4	7	4
5	9	5
6	11	6
7	13	7
8	15	8
9	17	9
10	19	10

OL 11…20

OL	Tip	Shield
1	1	2
2	3	4
3	5	6
4	7	8
5	9	10
6	11	12
7	13	14
8	15	16
9	17	18
10	19	20

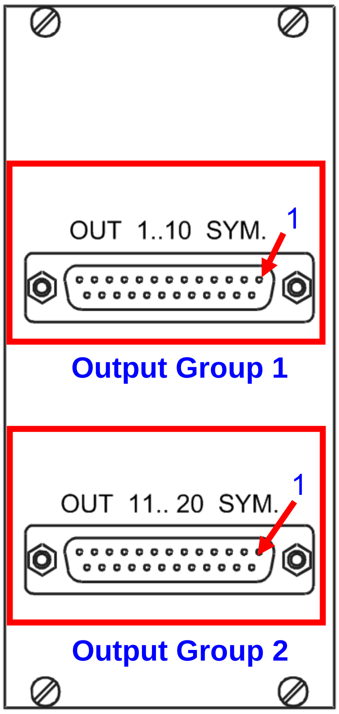


STEP	ACTION
1	Install the Remote panel in the rack where the 5548C is located using four screws and their washers
2	Connect the Remote panel to the ground
3	Locate the connector tile corresponding to the group required to cable. Refer to the 5548C drawings on Figure 4-8 : OUC Groups & Tiles Location for card and connector tiles slot references
4	Select a connector, which will be configured with the signal desired. The output port configuration is done by software as described in section 6.9
5	Connect the ribbon cable supplied by Oscilloquartz on the tile's connector required.
6	Connect the other end of the ribbon cable on the Remote panel's output tile desired
7	Check that cable is well tightened

Procedure 4-9 Cabling the BNC Remote Panel

4.5.2.5 Cabling SUB-D 9 Output Port Remote Panel

20x SYMMETRICAL with SUB-D 25 pins female 120 ohms

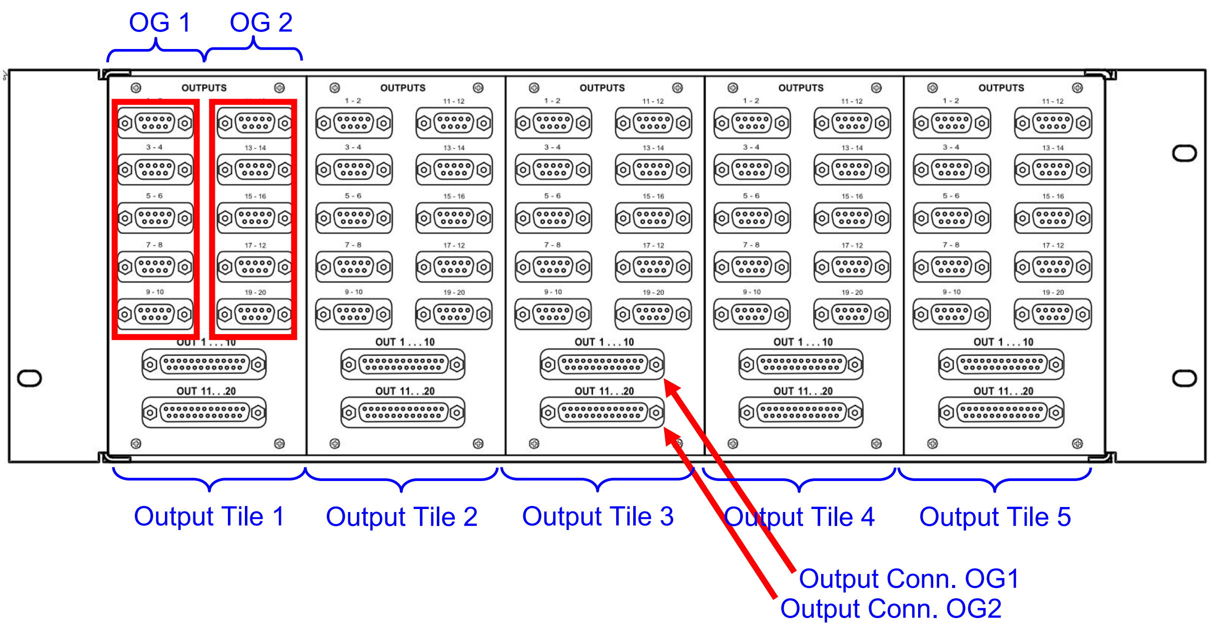


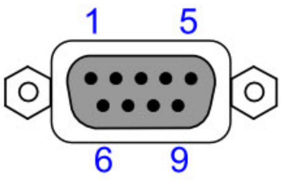
OL 1…10

OL	Tip	Ring	Shield
1	25	12	13
2	24	11	13
3	23	10	20
4	22	9	20
5	21	8	7
6	19	6	7
7	18	5	14
8	17	4	14
9	16	3	1
10	15	2	1

OL 11…20

OL	Tip	Ring	Shield
11	25	12	13
12	24	11	13
13	23	10	20
14	22	9	20
15	21	8	7
16	19	6	7
17	18	5	14
18	17	4	14
19	16	3	1
20	15	2	1





SUB-D 9 pole female

PIN	DESCRIPTION
1	Ring (out x)
2	Tip (out x)
3	NC
4	Shield
5	Shield
6	Shield
7	NC
8	Ring (out x+1)
9	Tip (out x+1)

Table 4-3 SUB-D 9 Pole pin description

STEP	ACTION
1	Install the Remote panel in the rack where the 5548C is located using four screws and their washers
2	Connect the Remote panel to the ground
3	Locate the connector tile corresponding to the group required to cable. Refer to the 5548C drawings on Figure 4-8 : OUC Groups & Tiles Location for card and connector tiles slot references
4	Select a connector, which will be configured with the signal desired. The output port configuration is done by software as described in section 6.9
5	Connect the ribbon cable supplied by Oscilloquartz on the tile's connector required.
6	Connect the other end of the ribbon cable on the Remote panel's output tile desired
7	Check that cable is well tightened

Procedure 4-10 Cabling the SUB-D Remote Panel

4.5.2.6 PPS Connectors

There are two BNC connectors on the Management tile labeled PPS 1 & PPS 2, see Figure 4-10. See section 9.5 for specifications.

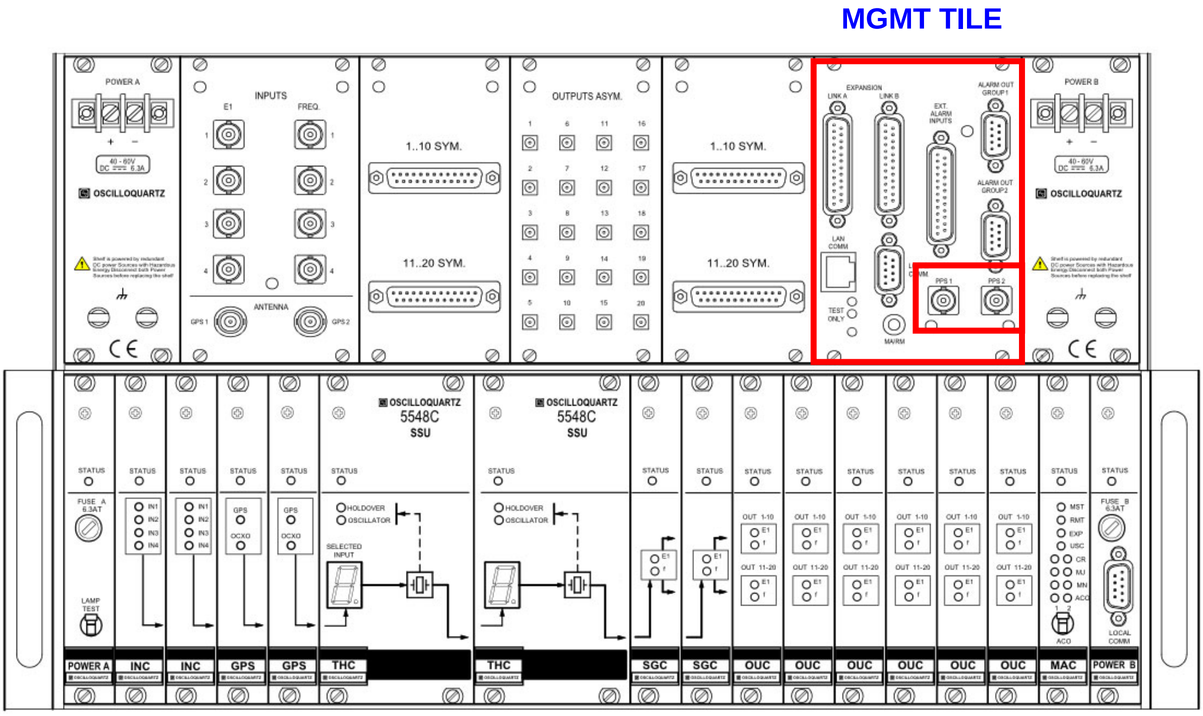


Figure 4-9 : Output Connectors PPS location (slot A102)

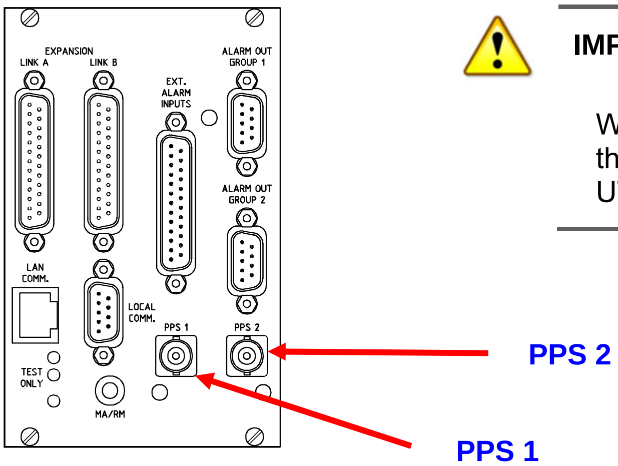


Figure 4-10 : Output Connectors PPS

IMPORTANT*:*

When no GPS receivers are installed, the PPS signal is not phase-locked to UTC.

PPS is phase-locked to UTC when GPS receiver cards are locked to GPS signal.

4.5.2.7 Cabling a PPS Output Connector

STEP	ACTION
1	Choose a PPS output BNC connector available.
2	Use a coaxial cable 50 ohms with BNC male termination and connect it into the intended connector.
3	Check that the cable is tightened correctly.

Procedure 4-11 Cabling a PPS Output Connector

4.6 Alarms

Figure 4-11 shows two types of alarm connectors, the EXTERNAL ALARM INPUTS and the ALARM OUT group 1 & 2.

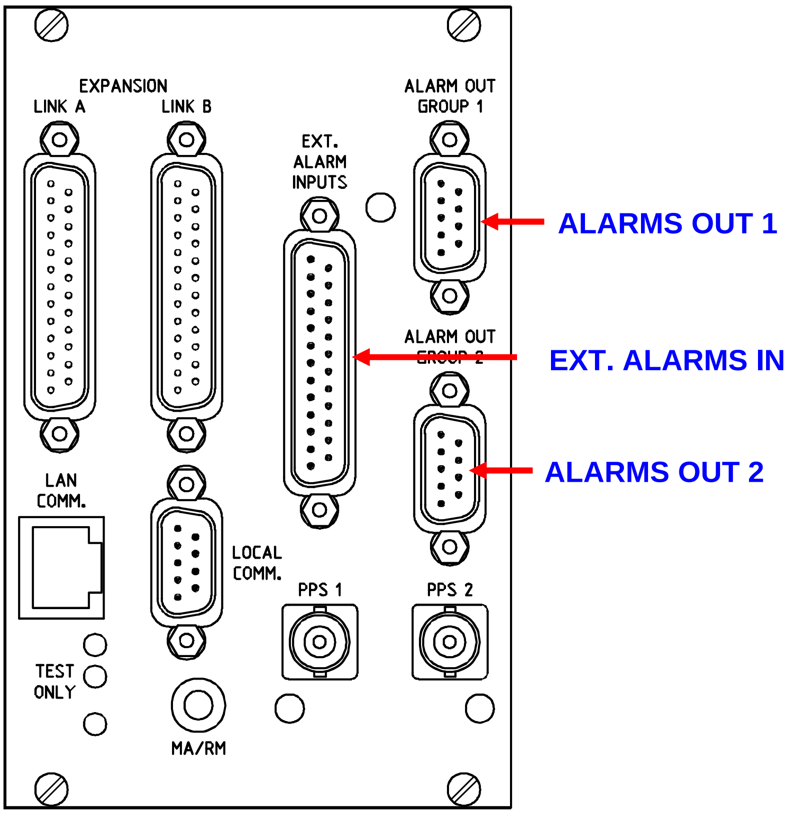


Figure 4-11 : Alarms - Management Tile

The OSA 5548C unit includes 10 input alarms. These are used to remotely manage external units. And two groups of NC (Normally Closed) & NO (Normally Opened) relays contacts to remote alarms to third party devices.

4.6.1 External Input Alarms

The OSA 5548C SSU unit includes ten input alarms. These are used to remotely report external unit's alarms.

EXT. Alarm Inputs - SUB-D 25p Male

DESCRIPTION	PIN	Severity
Alarm 1	25	CRITICAL
Alarm 2	24	CRITICAL
Alarm 3	23	CRITICAL
Alarm 4	22	MAJOR
Alarm 5	21	MAJOR
Alarm 6	18	MAJOR
Alarm 7	17	MINOR
Alarm 8	16	MINOR
Alarm 9	15	MINOR
Alarm 10	14	Non Alarmed
GROUND (GND)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	-
Not Connected	19, 20	-

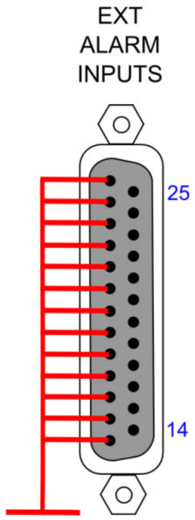


Figure 4-12 : External Input Alarm Connector

The OSA 5548C SSU will automatically generate event messages in case of defined alarm condition status.

When the contact between the pin IN and GND is closed or opened, the OSA 5548C SSU will take this state as a remote alarm.

4.6.1.1 Typical Application

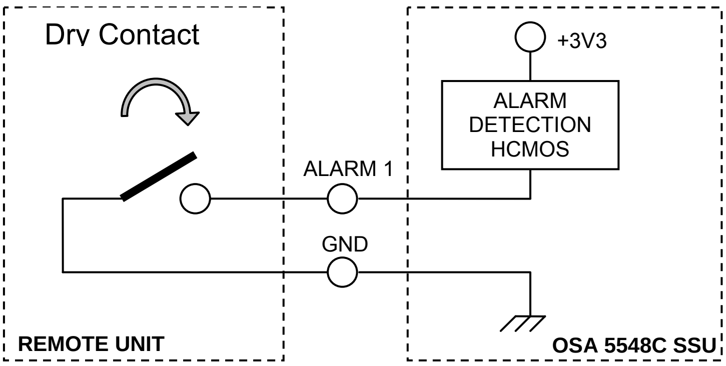


Figure 4-13 : External Input Alarm Application

4.6.1.2 Cabling Procedure

STEP	ACTION
1	Locate the connector “EXT. ALARM INPUTS” on the Management tile. See Figure 4-11.
2	Connect a SUB-D 25 Female wired with respect to the Figure 4-12 : External Input Alarm Connector
3	Tighten the two fixation screws
4	Verify that the connections have been correctly effected.

Procedure 4-12 External Alarm Input Connection

CAUTION

Do not supply power into the IN pin or a voltage offset between IN pin and GND pin, only a dry contact closure or opening can be connected.

Please read the specifications in section 9.6.2

4.6.2 Output Alarm Groups

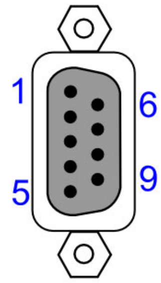
The OSA 5548C SSU unit presents two groups of electrical output alarms (ALARM OUT 1 / 2) as shown in Figure 4-11. Each group includes 3 levels of alarms:

- Critical Alarm
- Major Alarm
- Minor Alarm

Each alarm contains three connections allowing the user to connect alarms as Normally Open (NO) or Normally Closed (NC).

Alarm Output Groups – SUB-D 9p female

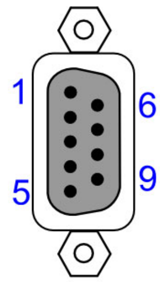
ALARM OUT
GROUP 1



female

ALARM OUT GROUP 1			
SEVERITY	**NO**	**C**	**NC**
CRITICAL	1	6	2
MAJOR	7	3	8
MINOR	4	9	5

ALARM OUT
GROUP 2



female

ALARM OUT GROUP 2			
SEVERITY	**NO**	**C**	**NC**
CRITICAL	1	6	2
MAJOR	7	3	8
MINOR	4	9	5

Figure 4-14 : Output Alarm Connection

Note:

One connector set can be reserved for Visual Alarms, while the other is reserved for Audible alarms.

4.6.2.1 Typical Application

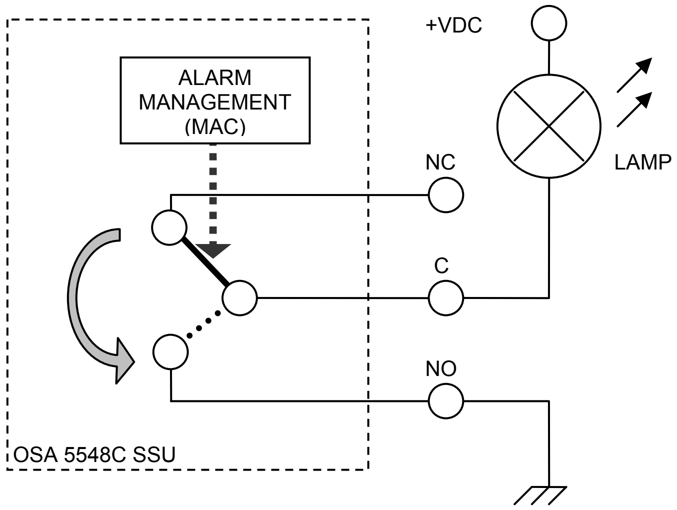


Figure 4-15 : Output Alarm Application

4.6.2.2 Cabling Procedure

CAUTION

Before cabling, please read and follow the specifications in section 9.6

STEP	ACTION
1	Locate the connector ALARM OUT GROUP 1 or 2 on the Management tile. See Figure 4-11
2	Select the SUB-D 9 pins connector required
3	Connect a SUB-D 9 pins male wired with respect to the Figure 4-14
4	Tighten the two fixation screws
5	Verify that connections have been done correctly

Procedure 4-13 Output Alarm Connection

4.7 Cabling Communication Ports

Recommendation:

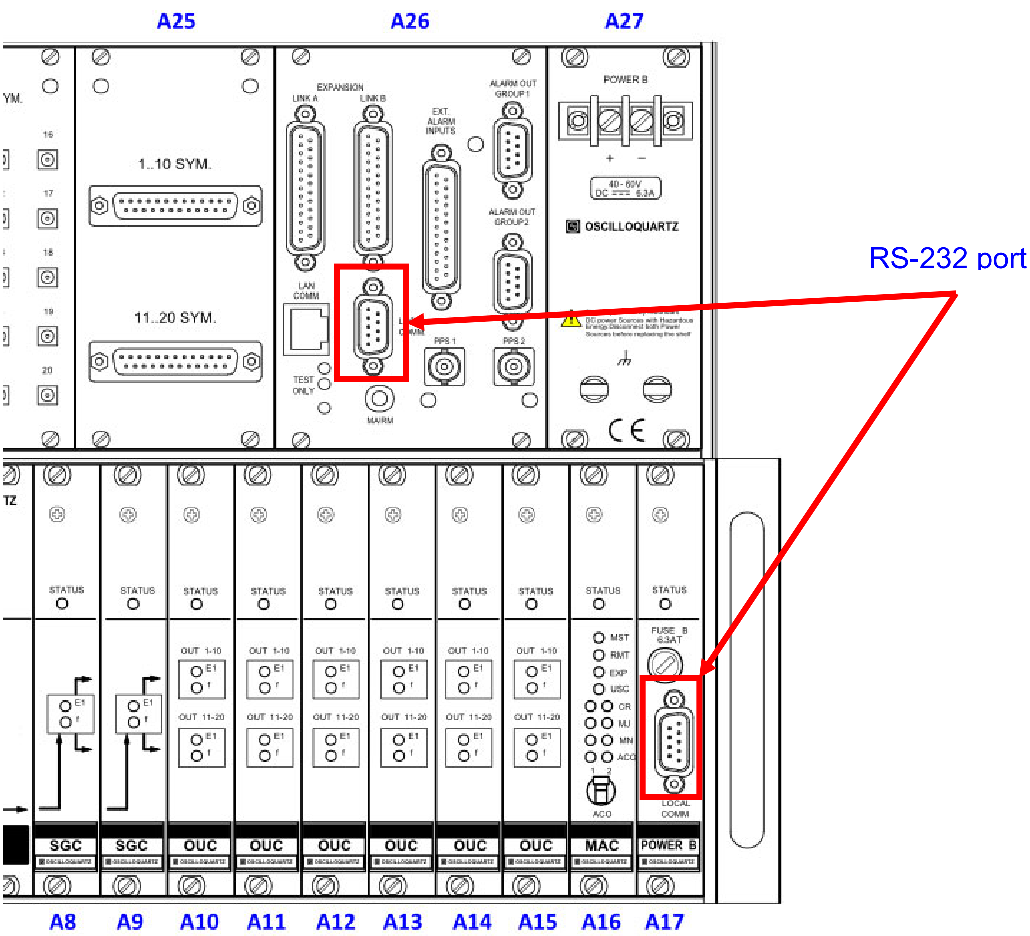
In order to take full benefits of the 5548C SSU management possibilities, we recommend installing and using the SyncTerminal and/or SyncView PLUS software.

4.7.1 Local Connection

The OSA 5548C enables to communicate locally via two RS-232 serial ports. It is possible to connect a computer or laptop to communicate with a terminal emulator software with the recommended software supplied with the OSA 5548C SSU.

The two communication ports can be used simultaneously.

Figure 4-16 : Communication Port Location



4.7.1.1 RS-232 / AT-Link serial cable

AT-LINK or Null Modem Cable with two ends SUB-D 9p Female

SUB-D 9p Female on cable-end	SUB-D 9p Female on cable-end
1	7
7	1
2	3
3	2
4	6 & 8
5	5
6 & 8	4
9	9

Table 4-4 AT-LINK Serial Cable PIN assignment - Local Comm.

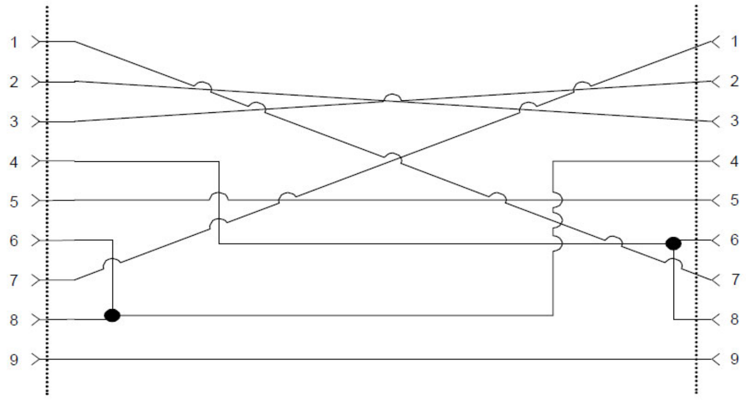


Figure 4-17: AT-LINK Serial Cable drawing

Note:

This cable can be ordered. See Ordering information section.

Should the computer or laptop only have USB ports, use a universal USB to RS-232 adapter.

4.7.2 Ethernet/LAN Connection

The OSA 5548C SSU allows communicating with via an Ethernet network for remote management. A RJ-45 port is located on the management tile.

Connector specifications	Label:	**LAN comm.**
	Type:	**RJ-45**
	Cable type:	**100 Base-T Category 5**

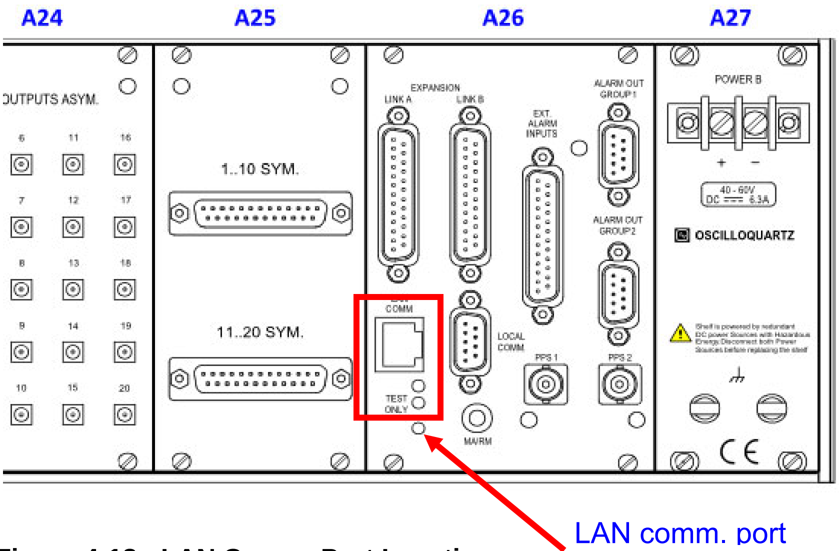


Figure 4-18 : LAN Comm. Port Location

4.8 Installation Check List

This table is designed to help you in verifying that all required tasks have been done before powering-up the shelf as described in the chapter 4

Item	Tasks	☑
1	Unpack the shelf carton and inspect the material according to the order acknowledgement or the packing list.	☐
2	Confirm that all the intended cards and tiles are inserted correctly and tightened in the shelf.	☐
3	Confirm that the shelf's ears are adjusted according to the width required	☐
4	Confirm that the shelf is mounted in a rack with at least 1 RU (1.79'' / 45mm) of clearance below the shelf	☐
5	Confirm that the shelf is grounded from the grounding studs to a reliable earth point in the rack	☐
6	Confirm that voltage and polarities on the two power cables are compliant	☐
7	Confirm that the power cable is connected to both POWER A and POWER B connector tile	☐
8	Confirm that the input and/or output connectors is cabled to the corresponding connector tiles	☐
9	Confirm that the external input and/or output Alarms connectors are cabled accordingly	☐
10	Confirm that the remote "LAN COMM." and/or local serial "LOCAL COMM." connector(s) are cabled	☐

Table 4-5 Installation Check List

Chapter

5. Turn-up Procedure

Including:

- Overview
- Power-up
- Card Start-up Sequences

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5.1 Overview

Recommendation:

The chapter 4, entitled "Equipment Installation", must be carefully read prior to this chapter.

This chapter describes the power-up procedure and the behaviors shown by each single card inserted in an already powered shelf. It does not include the Downloading description.

Many different scenarios can be shown if the shelf has already been configured and provisioned.

This section is divided into the following sections.

Power-Up procedure section, explains the instructions & the precautions to Turn-up the shelf as well as its behavior during this procedure.

Cards Turn-up sequence section, describes the LEDs and behaviors during card start-up process after insertion.

5.2 Power-up

Note:

The OSA 5548C SSU does not include a Power-switch to switch it on. It is controlled by the insertion/removal of two fuses T 6.3A L 250V on the POWER A and POWER B card respectively or by the insertion/removal of the two POWER cards.

At this point, voltage & polarity checks are complete.

STEP	ACTION
1	Install the fuse into the POWER B card.
2	Install the fuse into the POWER A card.
3	Now both POWER cards A & B should show their STATUS LED as GREEN and solid after been very shortly RED.
4	Focus on the MAC card located in slot A16. During the start-up sequence, it should show the following: 1. STATUS LED illuminates in solid GREEN 2. STATUS LED flashes in GREEN (~20s) 3. All LEDs light very shortly 4. MST LED lights in solid GREEN 5. RMT illuminates in solid GREEN shortly 6. CR, MJ and MN LEDs light in sequence one after the other

STEP	ACTION
	7. MST LED Blinks in GREEN 8. **Once the MAC MST LED has turn into GREEN solid, the communication with the 5548C is possible.**
5	Except THC Cards, all cards should show their STATUS LED in GREEN solid. The THC cards remain with a RED STATUS LED until they are able to supply a proper sync clock to the rest of the shelf. **It is therefore recommended to allow the THC cards ending their warm-up procedure, which takes up to 30 minutes.**
6	Once all the cards are showing their STATUS LED in GREEN, the 5548C is ready to be provisioned. **Detailed TL1 commands to provision the 5548C are described in the chapter 6.** **Advanced users can go to chapter 7 where they can find quick commissioning procedures with fewer details.** **About warm start or restart of each card, please refer to the next section.**

Procedure 5-1 Power-up

5.3 Card Start-up Sequences

When the system is powered-up, the LEDs of each card embedded in the OSA 5548C SSU should show the sequences described in this chapter.

Recommendation:

Do not remove any card until all the cards have finished their own turn-up sequence. The THC performs the longest sequence.

CAUTION

Prior inserting any new card, verify that currently inserted cards are well inserted in their respective slot and that they have their locking screws well tightened.

5.3.1 PWR-Power Card

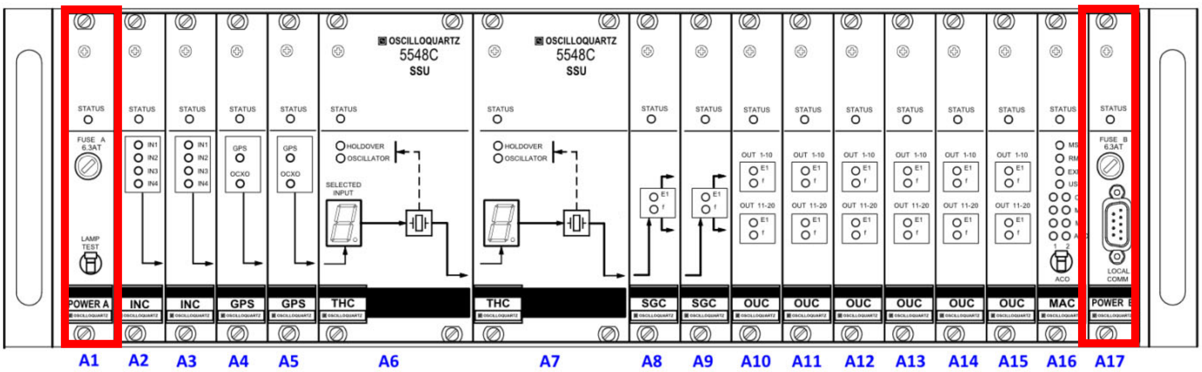

Figure 5-1 : Power Card Turn-up

Both POWER A (A1) & POWER B (A17) cards have the same behavior.

Seq.	STATUS	DESCRIPTION
1	GREEN	Once the card is inserted, the STATUS LED lights in GREEN. If any LED lights in RED, check the Voltage fed into POWER Connectors and its fuse (refer to section 8.4.4.1).

Table 5-1 Power Card Turn-up Status

5.3.2 MAC - MAnagement Card

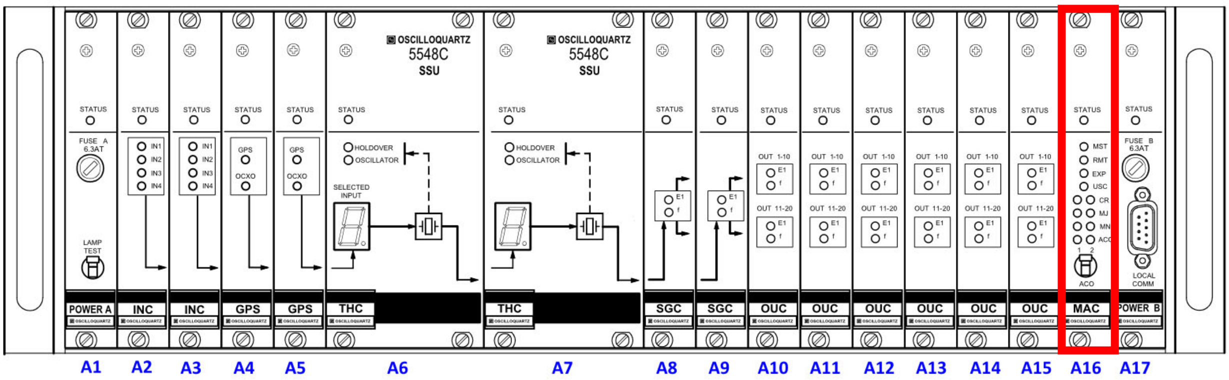

Figure 5-2 : Management Card Turn-up

Seq.	STATUS	MST	RMT	EXP	USC	Alarm level CR, MJ, MN	ACO	DESCRIPTION
1	GREEN	OFF	Extinguished					Initialization
2	GREEN Flashing	OFF	OFF					Boot (~20s)
3	GREEN	GREEN	OFF					Auto-test process
4	GREEN	GREEN	GREEN	OFF				
5	GREEN	OFF	OFF			The LEDs light in sequence one after the other		
6	GREEN	MST in GREEN Flashing		OFF		Any of these if any alarm detected	OFF	Establishing communication
7	GREEN	MST in GREEN solid		OFF		Any of these if any alarm detected	OFF	**Ready to communicate with the 5548C**

Table 5-2 MAC Card Turn-up Status

Note:

If the POWER-B card is not inserted or without its fuse, or if the shelf cannot retrieve its network parameters (IP address and/or MAC Address), the STATUS LED flashes in red. In almost all cases, once the POWER-B card or its fuse is inserted, extract and reinsert the MAC in order to restart it.

5.3.3 INC - INput Card

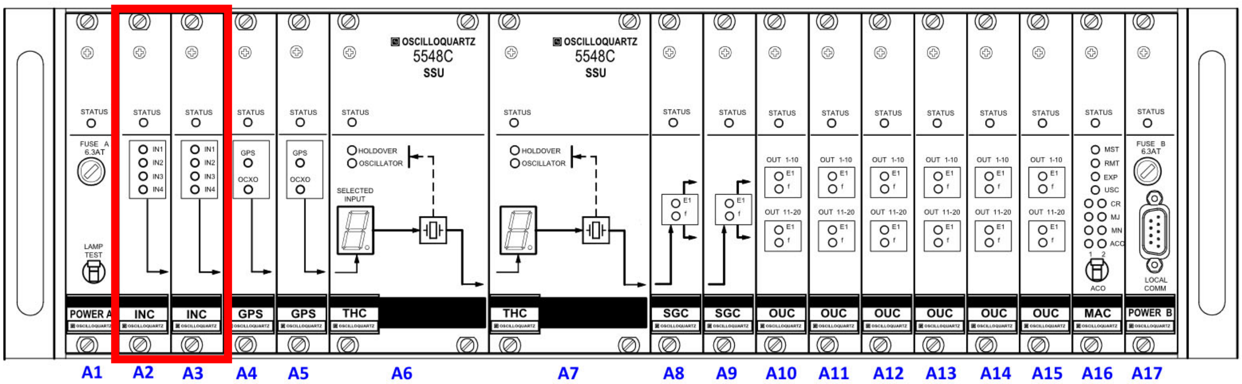

Figure 5-3 : Input Card Turn-up

Seq.	STATUS	IN 1 to IN 4	DESCRIPTION
1	RED	Extinguished	The status LED should be in RED for a few seconds
2	GREEN	GREEN on LED corresponding a Input Line provisioned and qualified	Different states can be shown depending on INC group and status of the Input Line.
		RED on LED corresponding to an Input Line not configured correctly or alarmed	
		GREEN Flashing on LED corresponding to an input with a Wait-To-Restore time currently elapsing.	
		ORANGE on LED corresponding to an Input Line currently set as Monitored	
		OFF correspond to a disabled input or if all the LEDs are off, it means that this INC card is the stand-by one.	

Table 5-3 Input Card Turn-up Status

5.3.4 GPS – GPS card

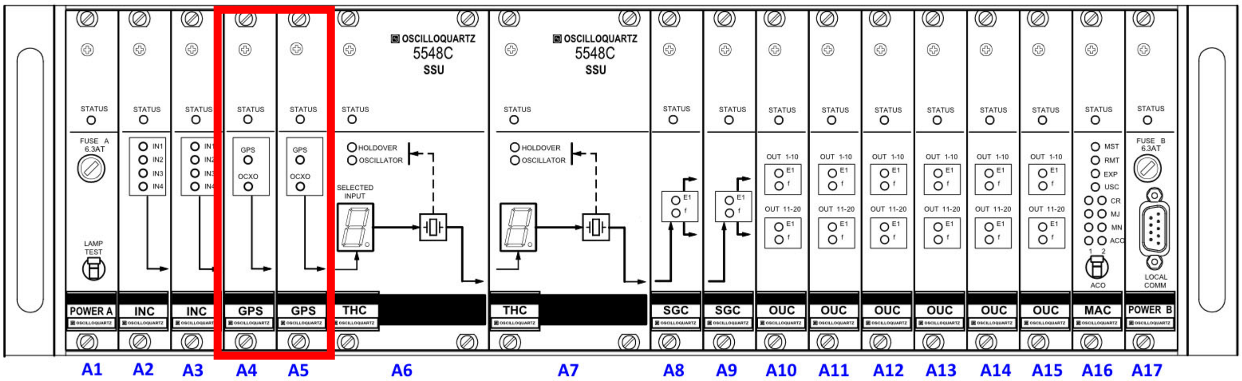

Figure 5-4 : GPS card Turn-up

Note:

The following procedure is shown when a valid and well mounted GPS antenna is connected to the related GPS input connector.

Seq.	STATUS	GPS	OCXO	DESCRIPTION
1	RED	RED	RED	Initialization
2	GREEN	RED	OFF	Start-up and GPS statellites research (~5 min)
3	GREEN	GREEN: GPS reception is OK	RED Flashing	GPS signal pre-tracking phase (~200s)
4	GREEN	GREEN: GPS reception is OK	OFF	This status is shown once the pre-tracking phase has ended.

Table 5-4 Input Card Turn-up Status

5.3.5 THC - Tracking Holdover Card

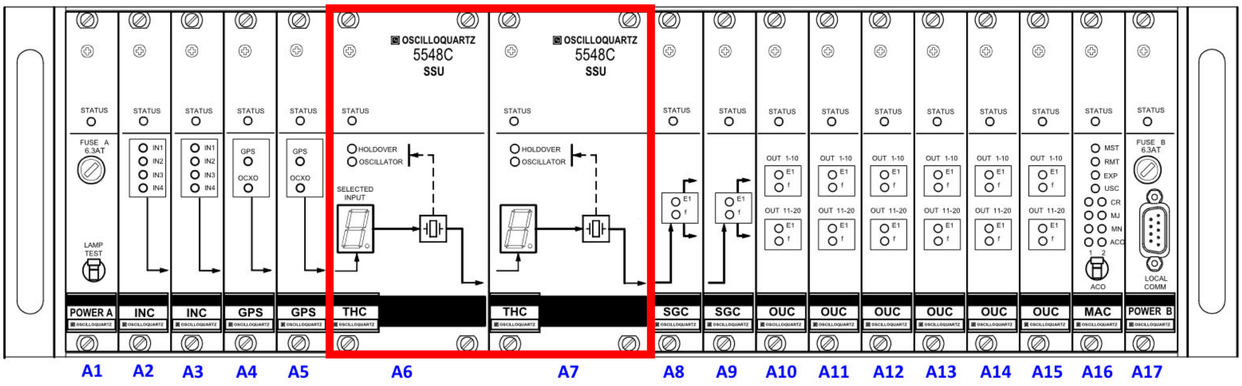

Figure 5-5 : Tracking Holdover Card Turn-up

Seq.	STATUS	HOLDOVER	OSCILLATOR	SELECTED INPUT	DESCRIPTION
1	RED until the THC can supply a proper signal	Extinguished	Extinguished	Extinguished	This status remains for a short time. However, the **STATUS LED remains RED until the THC is able to supply a proper signal** to the rest of the shelf, normally until the Warm-Up sequence has ended (OSCILLATOR LED has stopped flashing in RED)
2		Extinguished	RED Flashing	"." (dot) or nothing	The internal **oscillator is warming-up**. Depending on the Oscillator, the delay can be **up to 30min**.
3	GREEN	RED Flashing	Extinguished	Input Line Number accompanied with a "." (dot) give the Input Line number currently selected as reference. (G = GPS input) "-" (dash) if the THC is in holdover or freerun.	The THC is in fast start-up during a couple of minutes.
4	GREEN	Extinguished or RED if the THC is in Holdover	Extinguished		The THC is operating correctly.

Seq.	STATUS	HOLDOVER	OSCILLATOR	SELECTED INPUT	DESCRIPTION
				Nothing shown means that the THC is in stand-by and you should see a number on the adjacent THC card	

Table 5-5 Tracking Holdover Card Turn-up Status

Note:

Oscillator cold-start to warm-up intervals depend upon the type and configuration of the Oscillator modules installed. In example, Rubidium THC cards warm up faster than Quartz THC cards.

5.3.6 SGC - Signal Generator Card

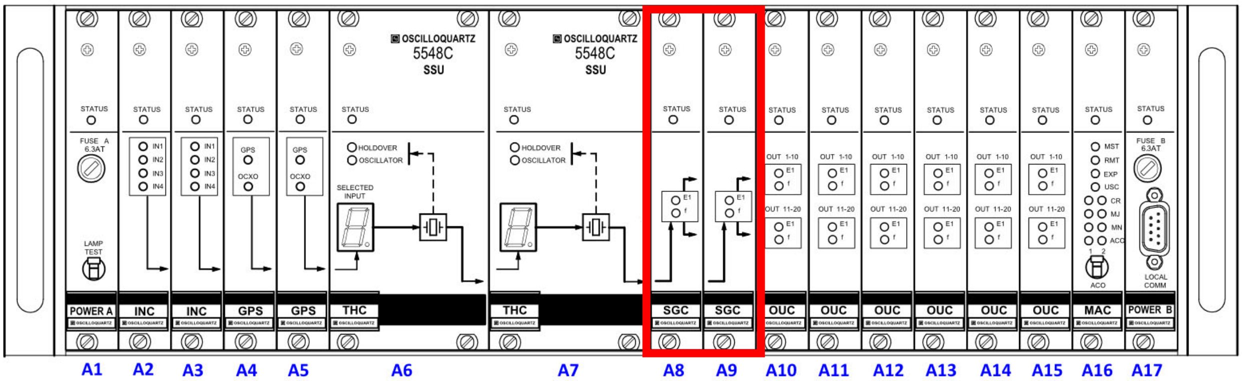

Figure 5-6 : Signal Generator Card Turn-up

Seq.	STATUS	E1	f	DESCRIPTION
1	RED	Extinguished	Extinguished	This status remains briefly.
2	GREEN	RED flashing	RED flashing	Status while the SGC does not receive any signal from the THC. The SGC cards squelch their outputs and the OUC cards do not receive signals.
		GREEN flashing	GREEN flashing	This condition means that the shelf is in Pass-through mode. So no THC is currently available to process input signal fed.
3	GREEN	GREEN	GREEN	The SGC now receives a signal from the THC and can process and supply it to the OUC

Table 5-6 Signal Generator Card Turn-up Status

Note:

Redundant SGC are simultaneously active and should show the same status at the same time.

5.3.7 OUC – OUtput Card

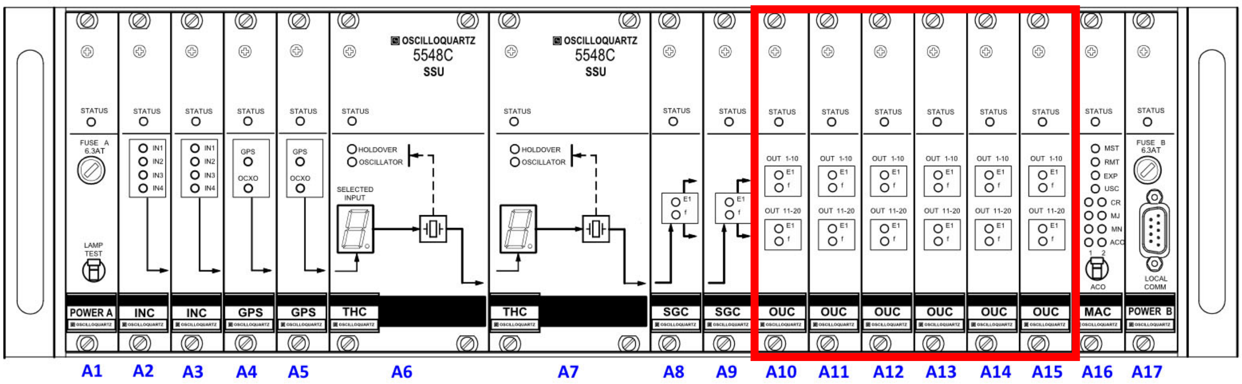

Figure 5-7 : Output Card Turn-up

Seq.	STATUS	OUT 1-10		OUT 11-20		
		E1	f	E1	f	DESCRIPTION
1	RED	Extinguished		Extinguished		This status remains very shortly
2	GREEN	E1 or f RED flashing		E1 or f RED flashing		Depending on the output configuration, either the f or E1 RED LED flashes during signal outage from SGC.
3	GREEN	E1 or f GREEN		E1 or f GREEN		Depending on the output configuration, either the f or E1 GREEN LED is lit, once the OUC has received a signal from the SGC

Table 5-7 Output Card Turn-up Status

Chapter

6. Operating & Provisioning

Including:

- Overview
- Communication
- Security Management
- General Parameters and Information
- Input Line (IL) Properties & INput Card (INC) Configurations
- GPS Configuration
- GNSS Configuration
- Line Switching, Tracking & Holdover (THC), Signal Filtering and Processing
- Signal Generation & Output Properties
- Synchronization Status Message - SSM
- Alarms & Events
- Performance Measurement (PM)
- Firmware Download

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6.1 Overview

This chapter provides instructions and procedure to configure the available functions and settings in the OSA 5548C SSU.

Recommendation:

Review the information in this chapter prior to configuration of the shelf.

6.2 Communication

Recommendation:

In order to take full benefit of the 5548C SSU management possibilities, use the SyncTerminal or SyncView PLUS software.

6.2.1 TL1 Protocol

Note:

All of the 5548C's TL1 commands are listed in the **"TL1 Command List"** document.

6.2.1.1 Overview

The OSA 5548C SSU uses the TL1 (Transaction Language 1) protocol to communicate. TL1 was defined in the 80's by Bellcore (now Telcordia) and is the dominant management protocol for controlling telecommunications networks in North America, China and other parts of the world.

The TL1 protocol consists of a set of ASCII messages or instructions that a terminal emulator, the ***SyncView PLUS*** uses to handle the OSA 5548C SSU functions.

Among the TL1 commands implemented in the OSA 5548C SSU, several are compliant with:

- Telcordia GR-199-CORE (OTGR: Operations Application Messages - Memory Administration Messages)
- Telcordia GR-833-CORE (Network Maintenance: Network Element and Transport Surveillance Messages)
- TR-NWT-835 (Operations Application Messages – Network Element and Network System Security Adminitration Messsages

The GR-831 standard specifies syntax, semantics, information structure, and other rules for uniform construction of TL1 messages.

6.2.1.2 TL1 Command Structure

In TL1, the messages are sent by the user to perform functions to manage the OSA 5548C SSU, or to observe faults and events emitted by the equipment. In other words, the TL1 messages are used to operate, administer, maintain, and provision the OSA 5548C SSU. There are two main types of standards-defined TL1 messages:

- **Command/responses.**
  These are initiated by the user and provide two parts: a request to the 5548C to get or set information, and a response from the 5548C containing completion or status codes and requested or chained information.

- **Autonomous events.**
  These are events, alarms or otherwise, that the 5548C emits indicating some change in its state.

The user executes TL1 requests via the SyncView PLUS or a command line interface (CLI) like the SyncTerminal software and receives notifications from the OSA 5548C SSU (autonomous events).

The TL1 message is easy to understand; each component of the message is easily identifiable. Below is an example of an ED-EQPT-OL message, which sets Output Line (OG) parameters, such as the squelch state and tits tag:

```
ED-EQPT-OL : [TID]  : 1-1  : CTAG  ::  SQUELCH=OFF,TAG="my tag"  ;
```

A	B	C	D	E	F	G
Command code block	***Staging block***				***Payload block***	

A: The TL1 main command defines the function to be executed in the OSA 5548C SSU. It is composed by different abbreviations like ED for Editing, RTRV for Retrieving, DLT for deleting in the form VERB-MOD1[MOD2]. More details about abbreviation are described in next sections.

B: Target Identifier (TID) is required in all input commands, but its value can be null. In the 5548C, the TID is represented between two brackets "[" and "]" as it is an optional value.

C: Access Identifier (AID) contains parameters that uniquely identify the entity within or associated to the OSA 5548C SSU. In the above example, it corresponds to the Output Group (1-1).

D: **Correlation Tag (CTAG)** is a sequential command identifier to be used with every command input. The CTAG correlates acknowledgments, errors, and responses with an originating request.

E: **General Block Format** is usually empty, and is the fourth and final parameter in the TL1 message's staging block.

F: **The Payload block** of any TL1 command message contains any additional information needed to carry out the specified command. Typically any parameters associated with the operation are conveyed within this block.

G: **The TL1 input message terminator** is a semicolon "**;**" which must always end any input or command messages.

6.2.1.3 Abbreviations and Characters for Command Format Types

Characters for commands and received messages

Characters	Description	Example
[ ]	Optional parameters or command. Two types exist: • The parameters defined by variable; i.e [VARIABLE=PARAMETER] can be ignored and not typed in the command • The single parameter must be located by its position in the command; i.e to set the PARAMETER2 in the following series: [PARAMETER1], [PARAMETER2], [PARAMETER3] It should be written with nothing at its position, such as follow: PARAMETER1,,PARAMETER3	**[**tid**]**
,	Separate value or parameters.	IL-1-1**,**IL-1-2
" "	Text parsed within an answer or an autonomous message	**"**1,2,3,4,5,6,7,8,9,**"**
.. or …	List of (logical) values between the first and the last written value	1**…**9
-	Separation in the command block or within a parameter name	ED**-**EQPT**-**MADDS IL**-**2**-**1
;	Termination of a command	RTRV-PRO:::ctag**;**
:	Separation between blocks	RTRV-PRO**:::**ctag;
=	Separation between the variable and its value or parameter	SSM**=**OFF
\" \"	Text description	**\"**CONDESCR**\"**

Table 6-1 TL1 Command Format Types

Verbs used in the TL1 command block

Abbreviation	Description	Example
RTRV	Retrieving information	RTRV-INV
ED	Editing a function or parameter	ED-EQPT-MAC
DLT	Deleting a function or element	DLT-EQPT
INIT	Initializing a part or function	INIT-SYS
ENT	Entering a new parameter	ENT-PORT
SET	Setting a new parameter	SET-SID
OPR	Operating a function or command	OPR-LEDS
REPT	Reporting a function or command	REPT ALM
ABT	Aborting a function or process	ABT-DNLD

Table 6-2 TL1 Command Block Verbs

6.2.1.4 Autonomous Message

An autonomous answer is sent by the OSA 5548C when something occurs in the shelf, such as an event or an alarm.

Example of autonomous alarm message:

```
   MAC-ACK 118-29-01 00-36-43
** 2784 REPT ALM
   "SGC:MJ,EQPT,SA,2005-29-01,00-36-43,,NA:\"Output failure\""
;
```

Alarm code	Description	Abbreviation
***C**	Critical Alarm condition	CR
******	Major Alarm condition	MJ
*****	Minor Alarm condition	MN
A	Non-alarmed or cleared autonomous message.	CL or NA

6.2.1.5 Response message

A response message is always sent back after sending a command to the OSA 5548C.

Example of response message:

```
        SID DATE TIME
M       CTAG RESPONSE_CODE
        DENY_ERROR
        /*MESSAGE*/
"
;
```

M : "M" Indicates that it is a response message

RESPONSE_CODE: This is the status of the commend sent. The below parameters can be answered:

- COMPLD :
  The command has been sent and received correctly, the response of the of the message can be shown in the **/*MESSAGE*/**
- DENY:
  An error occurred after sending the command. The error code is shown in "DENY_ERROR" and the description of the error is shown in **/*MESSAGE*/**.
  Refer to the section 6.2.1.6 for DENY ERROR messages.
- PRTL:
  The command has partially passed. The error code is shown in "DENY_ERROR" and the description of the error is shown in **/*MESSAGE*/**.
  Refer to the section 6.2.1.6 for PRTL ERROR messages

6.2.1.6 DENY or PRTL Errors

Command Sending Errors

Response Code	DENY Error	Message	Description	Action
DENY	IMSS	Internal error	System error	Resend the command and check if it redoes the same
PRTL	SRTO	Reply Time out occurred	Time until receiving an answer from the shelf has expired	Check the conection to the 5548C
DENY	PLNA	Login not active	User not logged	Login the 5548C
DENY	IBEX	Extra data block	Extra data block sent within the command	Check te command syntax and resend it accordingly
DENY	IBMS	Missing block	Block missing within the command sent	Check the command syntax and resend it accordingly
DENY	IDMS	Missing data field	Data field missing within the command sent	Check the command syntax and resend it accordingly

Response Code	DENY Error	Message	Description	Action
DENY	IDEX	Extra data Field	Extra data field within the command sent	Check the command syntax and resend it accordingly
DENY	IDNV	Data not valid	Data not valid within the command sent	Check the command syntax and resend it accordingly
DENY	IDRG	Data range error	Data range error within the command sent	Check the command syntax and resend it accordingly
DENY	IIFM	Invalid Payload block. Invalid Data format	Invalid data format or payload block within the command sent	Check the command syntax and resend it accordingly
DENY	ECNA	Command not implemented	The command sent is not implemented	Check the command syntax and resend it accordingly. If the command is supposed to exist, contact Oscilloquartz.
DENY	PARS	Parsing error on script	A parsing error occurred after sending the command	Check te command syntax and resend it accordingly
DENY	PIUI	Privilege, illegal user identity	The user does not have privilegee to send this command	Contact the 5548C administrator
DENY	SRQN	Invalid request	The request sent is invalid	Check the command syntax and resend it accordingly
DENY	RFNF	Requested condition already exists	The condition sent already exists	Retrieve the current condition and check that it exists accordingly.
DENY	IISP	Invalid syntax or punctuation	The syntax or punctuation within the command sent is not correct	Check the command syntax and resend it accordingly
DENY	INUP	Non null unimplemente d parameter	There is a parameter which should not be located at the place it has been sent	Check the command syntax and resend it accordingly
DENY	PICC	Privilege, illegal command code	The user does not have privilegee to send this command code	Contact the 5548C administrator

Internal Communication Bus (CAN) Errors Codes

Response Code	DENY Error	Message	Description	Action
DENY	EDNV	Data not valid	Data sent in command is invalid	Check the command syntax and resend it accordingly
DENY	ERQN	Invalid request	Request sent is invalid	Check the command syntax and resend it accordingly
PRTL	SRTO	Reply timeout occurred	Time until receiving an answer from the card in question has expired	Check the connection to the 5548C
PRTL	EUNK	Unknown Error	Unknown error on the command sent	Check the command syntax and resend it accordingly
PRTL	ERTE	Download Crc error	The file downloaded is not the same than the initial	Resend the command to download
PRTL	ERTE	EEPROM write error	A error of writing has been detected in the card's EEPROM	Contact Oscilloquartz
PRTL	ERTE	Event configuration error	The configuration of event contains an error	Check the event configuration. If no error is found, contact Oscilloquartz.
PRTL	ERTE	Test date error	The test date of the card's firmware is not correct	Contact Oscilloquartz
PRTL	ERTE	Configuration error	There is an error of configuration	Contact Oscilloquartz
PRTL	ERTE	CAN bus error	There is an error within the internal bus	Contact Oscillquartz
PRTL	ERTE	Null pointer error	System error	Contact Oscillquartz
PRTL	ERTE	Not applicable command error	Error in command sent	Check the command syntax and resend it accordingly

Firmware Upgrade Errors Codes

Response Code	DENY Error	Message	Description	Action
PRTL	RFNF	Remote File(s) not found	The 5548C could not find the firmware in the FTP server	Check the FTP server configuration
PRTL	CLST	Connection to FTP server lost	The connection to the FTP server is lost	Check the FTP server connection
PRTL	DABU	Download aborted by the user	The user has aborted the firmware dowload	-
PRTL	CDER	CRC download error	The data downloaded is not conform to the initial data	Restart the download
PRTL	FDEP	Firmware Download Executed Partially	The firmware downloaded has been partially executed	Restart the process or roll back to the previous version
DENY	FSDN	FTP server down	The FTP server is down	Check the FTP server status and its connection.

6.2.1.7 Card Abbreviation and Name used within TL1 Commands

In the below table are represented the cards with their corresponding abbreviation used with TL1 commands.

Slot	Abbreviation	Group name			Type
A1	*PWR-A is not software manageable*				
A2	INC-1-A		INC-1		INC
A3	INC-1-B		INC-1		INC
A4	GPS-A		GPS		GPS
A5	GPS-B		GPS		GPS
A6	THC-A		THC		THC
A7	THC-B		THC		THC
A8	SGC-A		SGC		SGC
A9	SGC-B		SGC		SGC
A10	OUC-1-A	TCC-1-A	OUC-1	TCC-1	OUC
A11	OUC-1-B		OUC-1		OUC
A12	OUC-2-A	TCC-2-A	OUC-2	TCC-2	OUC
A13	OUC-2-B		OUC-2		OUC
A14	OUC-3-A	TCC-3-A	OUC-3	TCC-3	OUC
A15	OUC-3-B		OUC-3		OUC
A16	MAC-A		MAC		MAC
A17	*PWR-B is not software manageable*				

Table 6-3 Card Names & Abbreviations within TL1

6.2.2 Establishing Communication with the 5548C SSU

The 5548C can communicate either via a direct serial connection using a computer with a terminal emulation software or if the 5548C is connected to a LAN (Local Area Network), through an Ethernet connection via TELNET.

Please refer to the below section 6.2.3 if it is necessary to connect a computer with direct serial connection or the 6.2.4 for the Ethernet connection.

6.2.3 Serial Port Communication

The OSA 5548C SSU has two serial communication ports RS-232C labeled “LOCAL COMM” located on the front of the POWER B card and the Management tile.

Cable type:	**AT-link - Nullmodem**
Cable termination:	**Sub-d, 9 pins, female**
5548C’s serial connector:	**LOCAL COMM.**

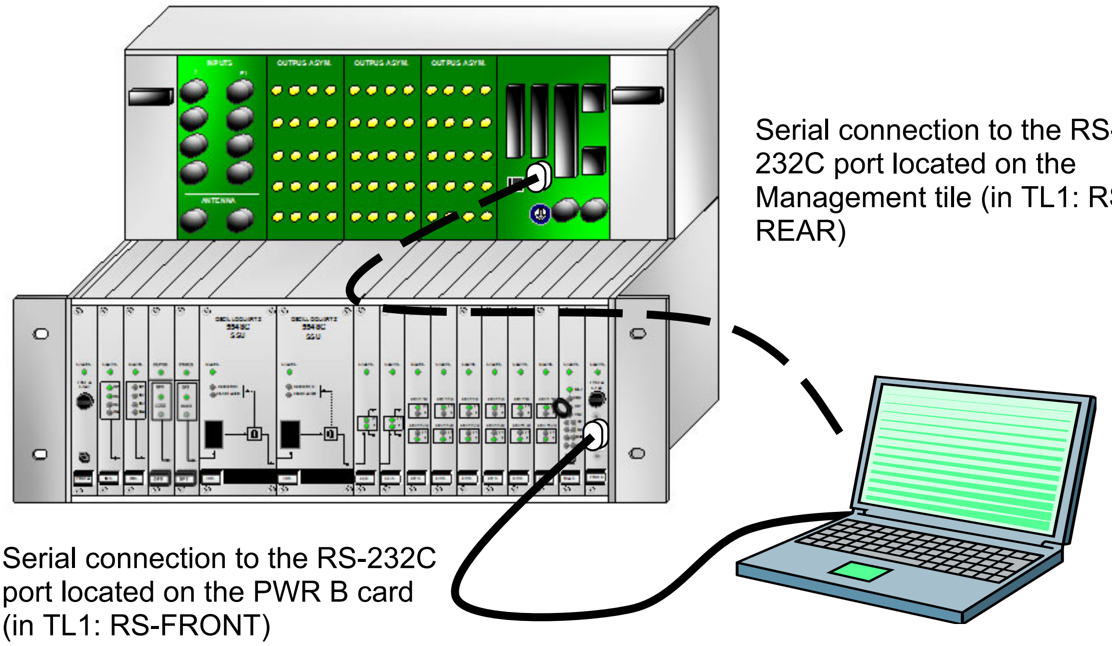


Figure 6-1 : Local Comm. Port Connection

Note:

The AT-LINK/NULL MODEM cable is described in section **Error! Reference source not found.**

6.2.3.1 Serial Port Configuration

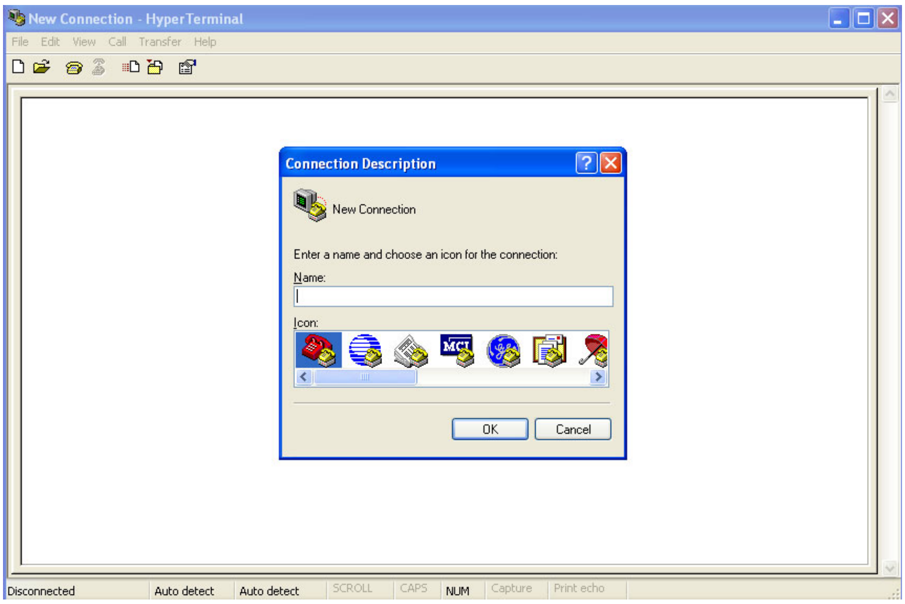
To establish the connection via serial port, here below is the configuration required to set up in the terminal emulator (i.e. HyperTerminal, Procomm, …).

Baud rate:	**19200 kbs**
Parity bit:	**None**
Stop bits:	**1**
Flow control:	**None**

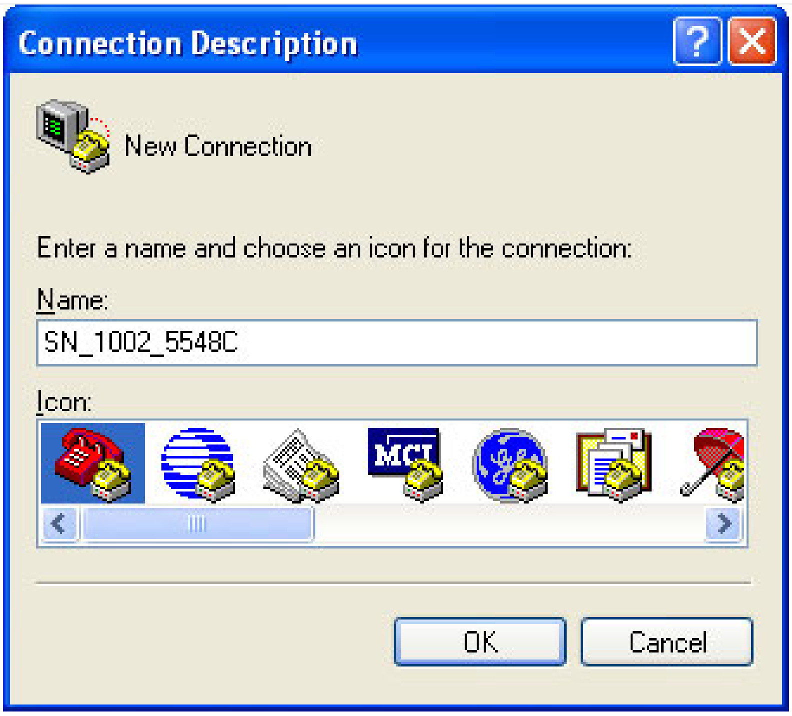
Note:

The communication via serial link is designed for RAW DATA with TL1 protocol.

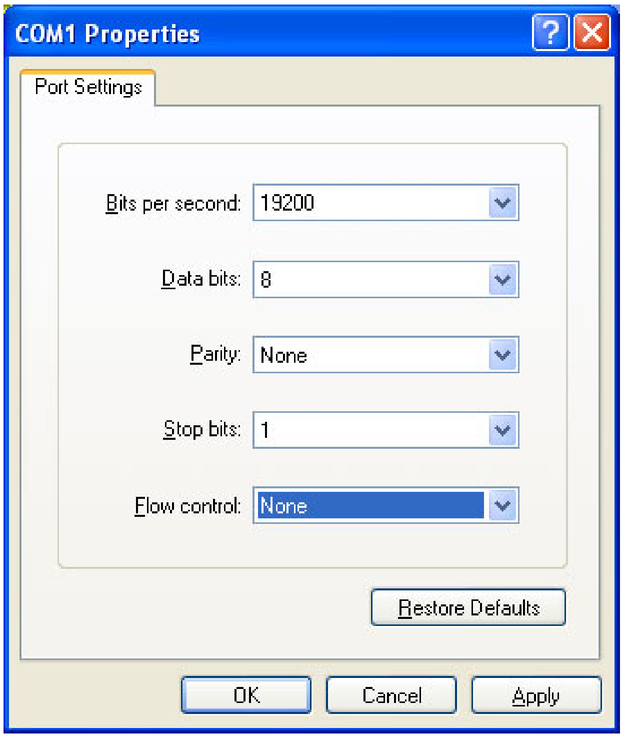
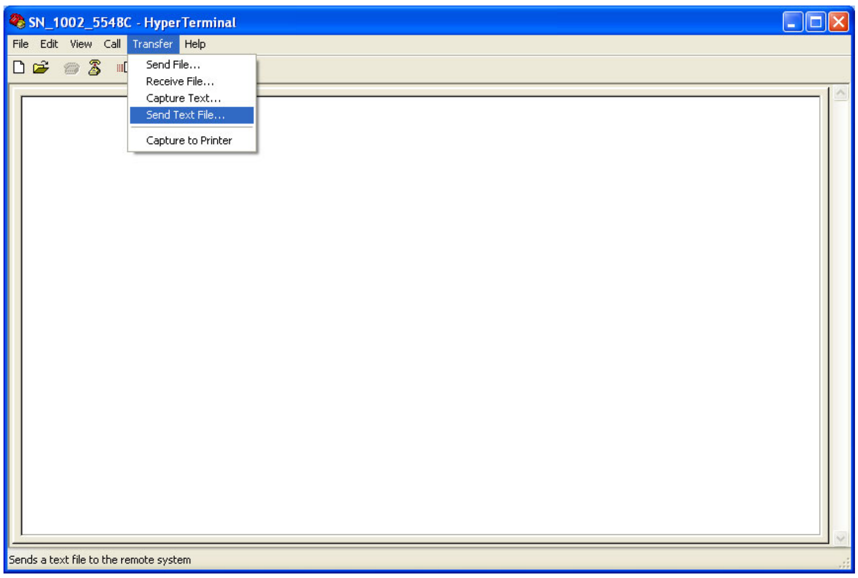
6.2.3.2 Serial Connection with Terminal Emulator

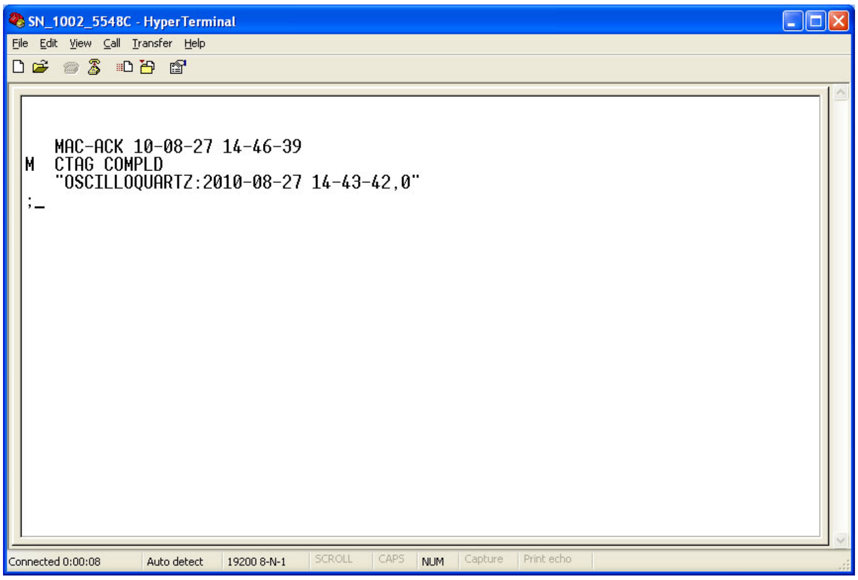
STEP	ACTION
1	Connect a null modem cable to one of the two RS-232 ports, located on the front and the rear side and labeled “LOCAL COMM”
2	Launch a terminal emulator (HyperTerminal for example) 

STEP	ACTION


Connection Description
New Connection
Enter a name and choose an icon for the connection:
Name:
SN_1002_5548C
Icon:
OK
Cancel


Connect To
SN_1002_5548C
Enter details for the phone number that you want to dial:
Country/region:
Switzerland (41)
Area code:
Phone number:
Connect using:
COM1
OK
Cancel

STEP	ACTION
3	Set the corresponding communication parameters as shown below 
4	At this stage, it's necessary to log on. Please create a txt file and insert: `ACT-USER::OSCILLOQUARTZ:CTAG::OSA;` Select "send text File…" and select the file previously created 

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>5</td><td>You are now connected. Use command in chapter “TYPE INFORMATION AND INVENTORY” -> section “using TL1”


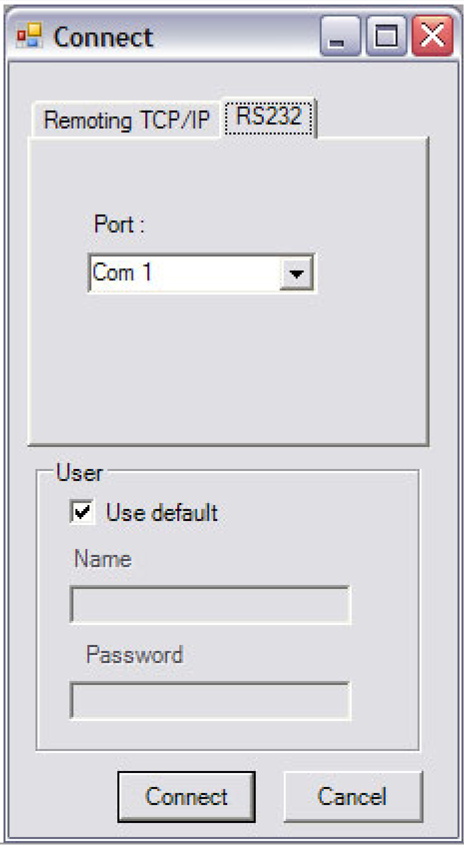
Example: To retrieve inventory used: “RTRV-INV::ALL:CTAG;”</td></tr>
</table>

Procedure 6-1 Serial Connection

Recommendation:

Osciloquartz highly recommends using SyncTerminal instead of other terminal emulators.

6.2.3.3 Serial Connection with the SyncView PLUS software

STEP	ACTION
1	Connect a null modem cable to one of the two RS-232 ports, labeled “LOCAL COMM”
2	Launch the SyncView PLUS software
3	Set the corresponding communication parameters as shown below with the Port where the Null Modem cable is connected on the computer and click “Connect” 

Procedure 6-2 Serial Connection with SyncView PLUS

6.2.4 Ethernet Communication

The OSA 5548C can be managed via an Ethernet connection.

Such as a usual Ethernet network element, you can define an IP address for the 5548C, an IP subnet mask and two gateways. The IP format is IPv4 with a format in dotted quad like 123.123.123.123.

6.2.4.1 Ethernet Port Configuration

Note:

If the OSA 5548C has never been connected via Ethernet port, you must configure the Ethernet parameters via a direct serial connection as detailed in the section 6.2.3

Send the following TL1 command replacing the bold letter words with the setting required to configure.

Input Syntax

```
ED-COM-SYS:::ctag::[IPADDRESS=ipaddress],[NETMASK=netmask],
[GW1ADDRESS=gw1address],[GW1NETMASK=gw1netmask],
[GW2ADDRESS=gw2address],[GW2NETMASK=gw2netmask],[ETHER_SPEED=10
/100],
```

Example:

```
ED-COM-SYS:::MYCTAG::IPADDRESS=149.133.41.25,
NETMASK=255.255.255.254,GW1ADDRESS=149.133.40.1,
GW1NETMASK=255.255.255.252, ETHER_SPEED=100
```

To store the new parameters, it is required to restart the MAC:

```
INIT-SYS::MAC-A:MYCTAG::WARM;
```

To check the Ethernet parameters, use the following TL1 command:

Input Syntax

```
RTRV-COM-SYS:::ctag;
```

Parameter name	Default Parameter	Description
IPADDRESS	149.133.41.4	IP address of the 5548C
NETMASK	123.123.123.123	IP subnet mask of the 5548C
GW1ADDRESS	149.133.40.1	IP address of the first gateway
GW1NETMASK	255.255.0.0	IP subnet mask address of the first gateway
GW2ADDRESS	0.0.0.0	IP address of the second gateway
GW2NETMASK	255.255.0.0	IP subnet mask of the second gateway
ETHER_SPEED	10	Ethernet speed

Table 6-4 Ethernet Parameters

6.2.4.2 Ethernet Connection

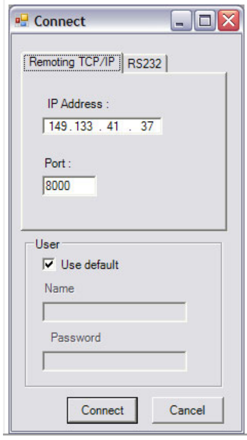
Note:

Prior to communicate remotely with the OSA 5548C SSU shelf, it is required to set the Ethernet parameters (IP, Gateway and Subnet mask addresses) using a direct serial port connection following section 6.2.4.1

STEP	ACTION
1	Connect the 5548C SSU to the LAN with an Ethernet cable 100 Base-T category 5 with RJ-45 connectors. Refer to section 4.7 for more details.
2	Connect one Ethernet cable end into the RJ-45 connector as shown on the Figure 4-18 : LAN Comm. Port Location
3	Test the connection with a PING to the shelf's IP
4	Using TELNET, access the IP address configured in the OSA 5548C SSU.

Procedure 6-3 Ethernet Connection

6.2.4.3 Ethernet Connection with the SyncView PLUS software

STEP	ACTION	
1	Connect the 5548C SSU to the LAN with an Ethernet cable 10 or 100 Base-T category 5 with RJ-45 connectors. Refer to section 4.7 for more details.	
2	Connect one Ethernet cable end into the RJ-45 connector as shown on the Figure 4-18 : LAN Comm. Port Location	
3	Test the connection with a PING to the shelf's IP	
4	Launch the SyncView PLUS software	
5		Set the 5548C's IP Address and click on the "Connect" button.

Procedure 6-4 Ethernet Connection with SyncView PLUS

6.2.5 Communication Ports

6.2.5.1 Default Communication Ports

Connector	Type	Available comm. type	Number of port(s) max.	Max. number of session(s) per port	Maximum of simultaneous sessions
On MAC card "**LOCAL COMM**"	RS-232C	Raw data	1	1	32
On MGMT tile "**LOCAL COMM**"	RS-232C	Raw data	1	1	
On MGMT tile "**LAN COMM**"	RJ-45	Raw data (by default) & Telnet	25	5	

Table 6-5 Default Communication Ports

Protocol	Default port	Available ports	Function
Telnet	8023	User selectable ports from **1025** to **9999**	For 5548C management with TL1 commands
Raw data	8000		For 5548C management with TL1 commands
FTP	21	Not user selectable	For card and shelf upgrade

Table 6-6 Ethernet Ports

6.2.5.2 Add, Edit or Remove a Port

Note:

It is possible to configure up to 25 Ethernet ports, but the maximum of simultaneous sessions (number of user connected simultaneously) is 32, including the sessions via serial ports.

Adding a new Ethernet port

It is possible to add up to 25 Ethernet ports within the range of 1025 to 9999

Input Syntax

```
ENT-PORT::aid:ctag::type;
```

To store the new parameters, it is required to restart the MAC:

```
INIT-SYS::MAC-A:MYCTAG::WARM;
```

Note:

The user security account must be configured to authorize the communication through any port. Read section 6.3.6 to allow a new port for a user.

Deleting an Ethernet port
To delete an Ethernet port within the range of 1025 to 9999, simply send the following command.

Input Syntax

```
DLT-PORT::aid:ctag;
```

To store the new parameters, it is required to restart the MAC:

```
INIT-SYS::MAC-A:MYCTAG::WARM;
```

Editing any port (Ethernet or RS).
With the following command, you can edit all the existing Ethernet and RS ports.

Input Syntax

```
ED-PORT::aid:ctag::[IDLEDELAY=idledelay],[SESSIONS=sessions];
```

Example:

```
ED-PORT::8023:MYCTAG::IDLEDELAY=10,SESSIONS=5;
```

To store the new parameters, it is required to restart the MAC:

```
INIT-SYS::MAC-A:MYCTAG::WARM;
```

Idle delay
It is possible to add an idle delay to any port. The idle delay determines the maximum time after a command allowing the user to stay connected after it, until the session/connection will close.

Example: If the idle delay is set to 5 minutes, after 5 minutes of inactivity, the access will automatically close.

Sessions
With the ED-PORT command, the maximum number of simultaneous sessions can be set to a limit. By default the number allowed is 3 and up to 5 simultaneous sessions can be set.

Retrieve the port parameters currently configured

Input Syntax

```
RTRV-PORT::aid:ctag;
```

Observe an answer as in the example below:

Output Syntax

```
       sid   date  time
M      ctag  COMPLD
```

`“aid:type:IDLEDELAY=idledelay,SESSIONS=sessions;”`

Parameter name	Default Parameter	Possible configurations	Description
AID		1025…9999, RS-FRONT, RS-REAR	This is the port number. The default port number to access the shelf via RAW DATA is 8000 and via TELNET it is 8023. RS-FRONT is the RS-232 port on the POWER B. RS-REAR is the RS-232 port on the Management tile.
TYPE	RAW	RAW, TELNET	This parameter is the type of communication. Set RAW for Raw data or Telnet
IDLEDELAY	5	1..60, NONE	After the idle delay, the session will be discontinued and will automatically disconnect the user. The idle delay is in Minute(s).
SESSIONS	3	0...5	This is the number of simultaneous sessions allowed for the related port.

Table 6-7 Communication Parameter Names

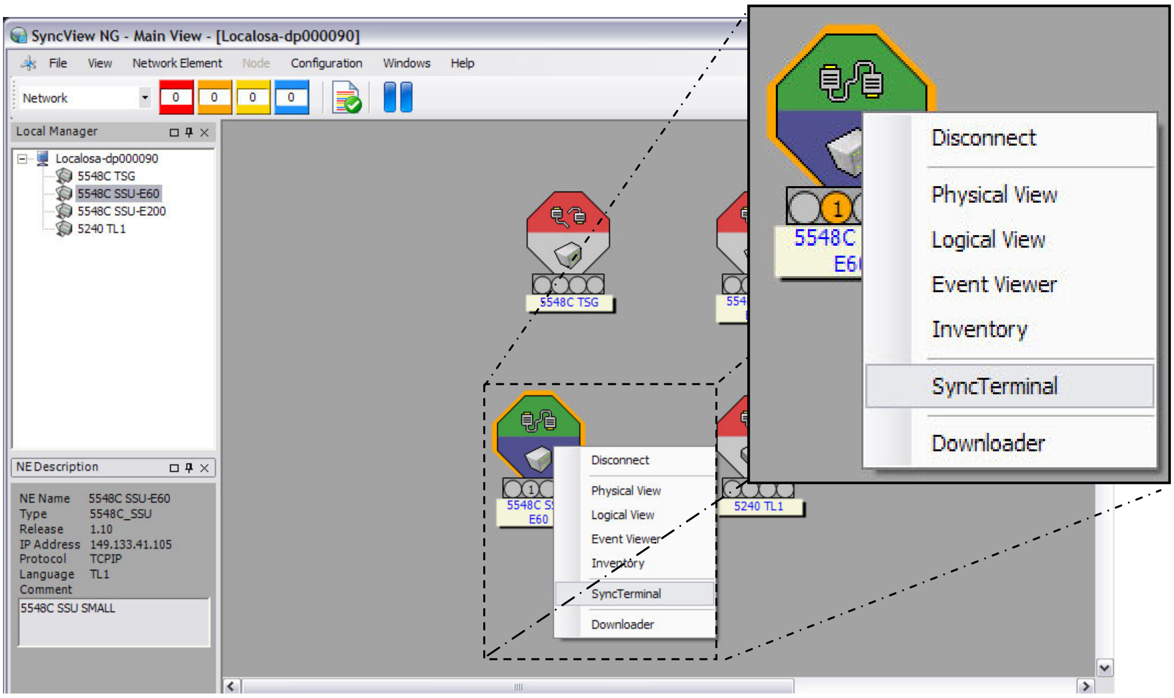
6.2.6 Using the *SyncTerminal* Software

6.2.6.1 Introduction

Use the ***SyncTerminal*** software to send TL1 commands to the 5548C. It enhances an emulator interface for sending TL1 commands to manage and configure the 5548C.

6.2.6.2 Opening the SyncTerminal from SyncView PLUS

The SyncTerminal is included in the *SyncView PLUS* software. Use the connection procedure as shown in the *SyncView PLUS* user manual; right-click on the OSA 5548C SSU-E60 icon and select “SyncTerminal”.



6.2.6.3 Overview

The ***SyncTerminal*** main window is divided in 4 principal parts:

- The top menu provides 4 menus of all main functions of the SyncTerminal.
- The shortcut menu presents rapid access to principal functions.
- The command tree contains all the TL1 commands available for the 5548C. The user can re-arrange then in alphabetical order.
- The main window is divided in two parts once you the 5548C is accessed.

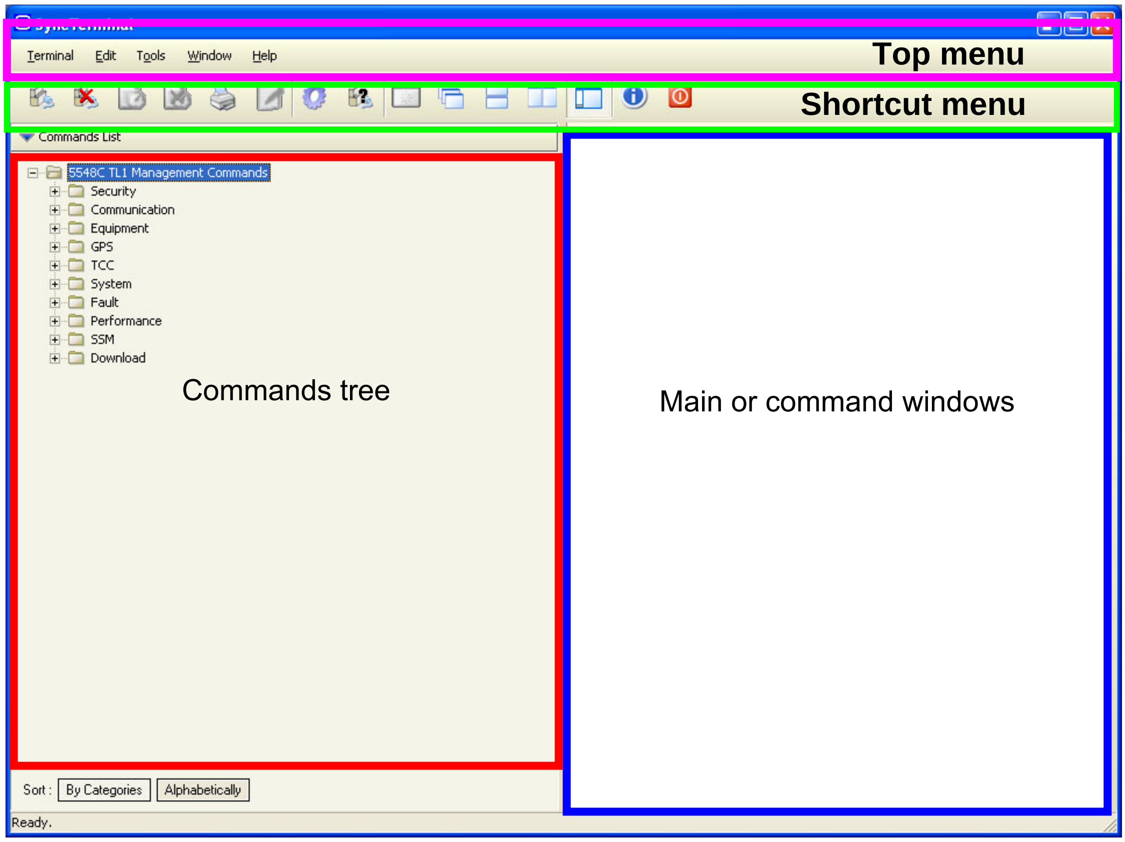
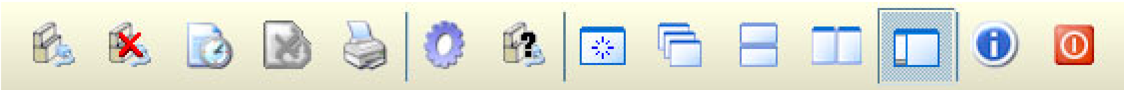


Figure 6-2 : SyncTerminal Main Window

6.2.6.4 Shortcut Menu



1 2 3 4 5 6 7 8 9 10 11 12 13 14

Figure 6-3 : SyncTerminal Short Cut Menu

1. **Connection**
   This button allows connecting to a network element.
2. **Disconnection**
   When pressing this button, it stops the current connection.
3. **Run**
   This button opens the script editor window.
4. **Stop running script**
   When a script is running, press this button to stop it.
5. **Print**
   It prints all the command's answers from the window's top-right side.
6. **Options**
   After pressing this button, the Options window pops-up.
7. **PING current connection**
   This button will automatically open the Microsoft Windows's console to ping the current connection IP address.
8. **Clear window**
   This function removes all the TL1 responses in the top-right part of the window.
9. **Cascade windows**
   Arranges multiple windows in cascade.
10. **Tile windows vertically**
    This button tiles multiple windows vertically.
11. **Tile windows horizontally**
    The button tiles multiple windows horizontally.
12. **View/Hide journal window**
    This function hides or unhides the left part of the SyncTerminal window.
13. **About SyncTerminal**
    When pressing this button, the "about" window appears.
14. **Exit**
    This function immediately closes the SyncTerminal.

Note:

There are fewer buttons when using the SyncTerrminal from the SyncView software

6.2.6.5 Send Command Window or Command Tree Menu

A command tree list for each type of equipment appears automatically after user configuration.

To sort, use the corresponding button under the list.

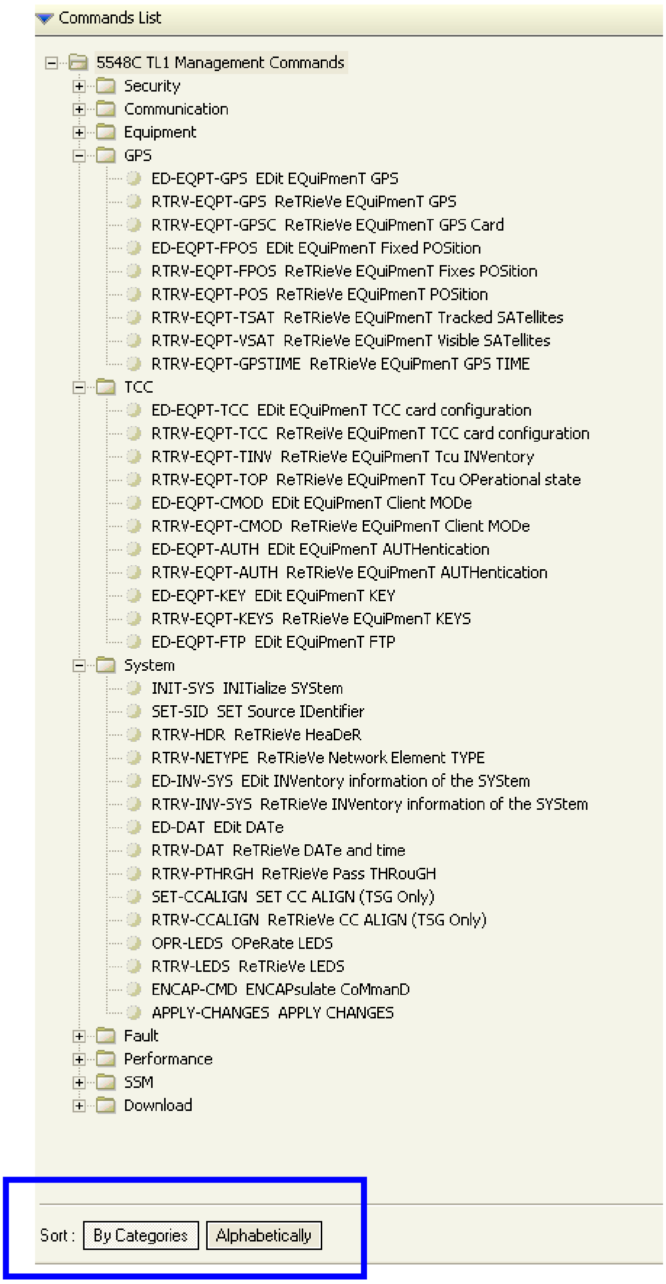


Figure 6-4 : SyncTerminal Short Cut Menu

6.2.6.6 Main or command window

Once the SyncTerminal is connected to the shelf, a new window appears on the right part of the SyncTerminal, as in the figure below.

On the top side, the SyncTerminal will respond to the commands, or automatically send information from the shelf.
On the bottom side, the operator types the commands.

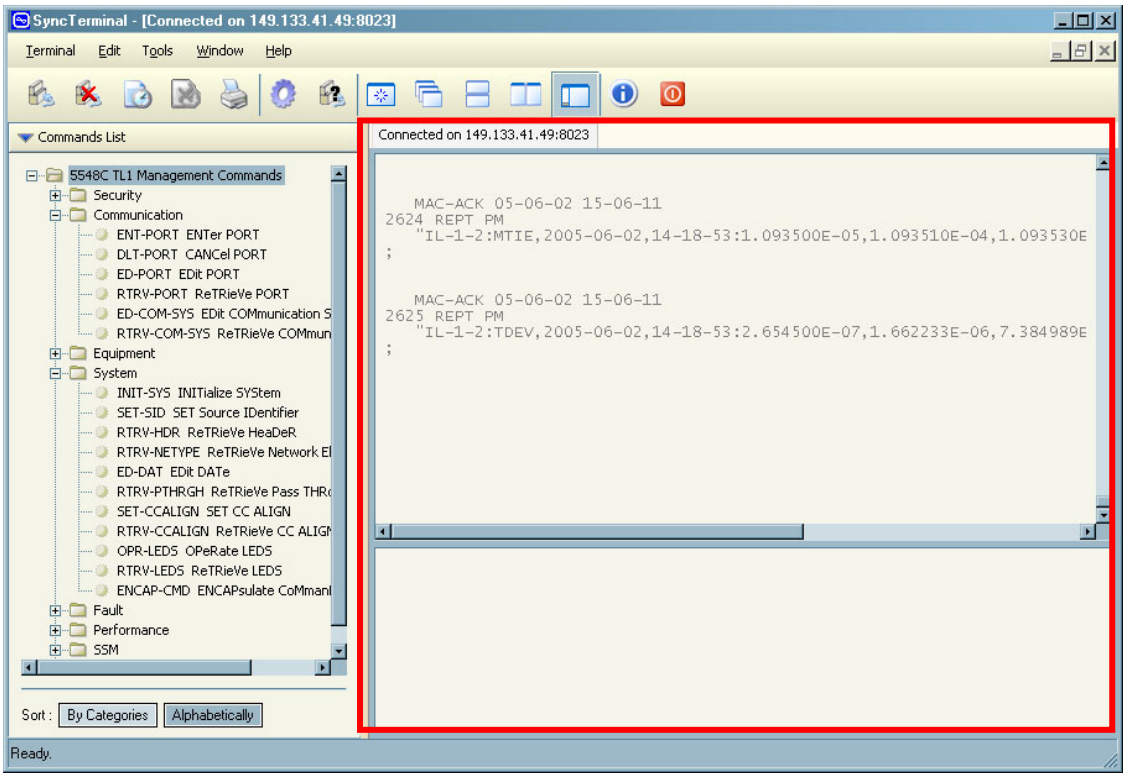


Figure 6-5 : SyncTerminal Main or Command Menu

6.2.6.7 SyncTerminal Connection Parameters

The SyncTerminal must be configured before attempting to access any equipment. It is necessary to configure the communication protocol (i.e. TL1, MML, etc.), the equipment commands type file (i.e. 48CTL1SSU.dat) and the connection type (Remote or Local)

Note:

When running SyncTerminal from the *SyncView PLUS* software, do not follow this procedure. The software automatically sets the SyncTerminal to connect the 5548C.

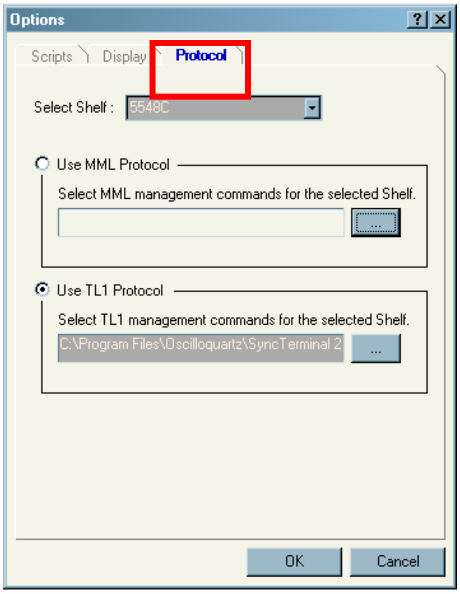
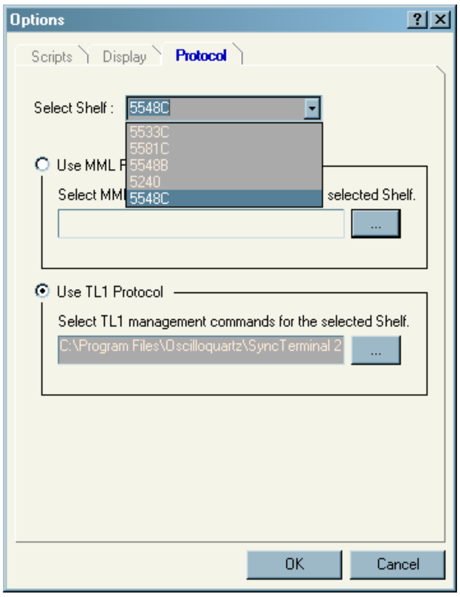
The following procedure configures the SyncTerminal in order to access the OSA 5548C SSU.

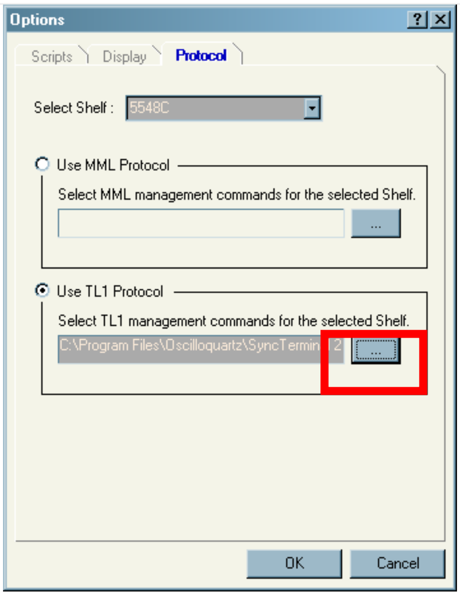
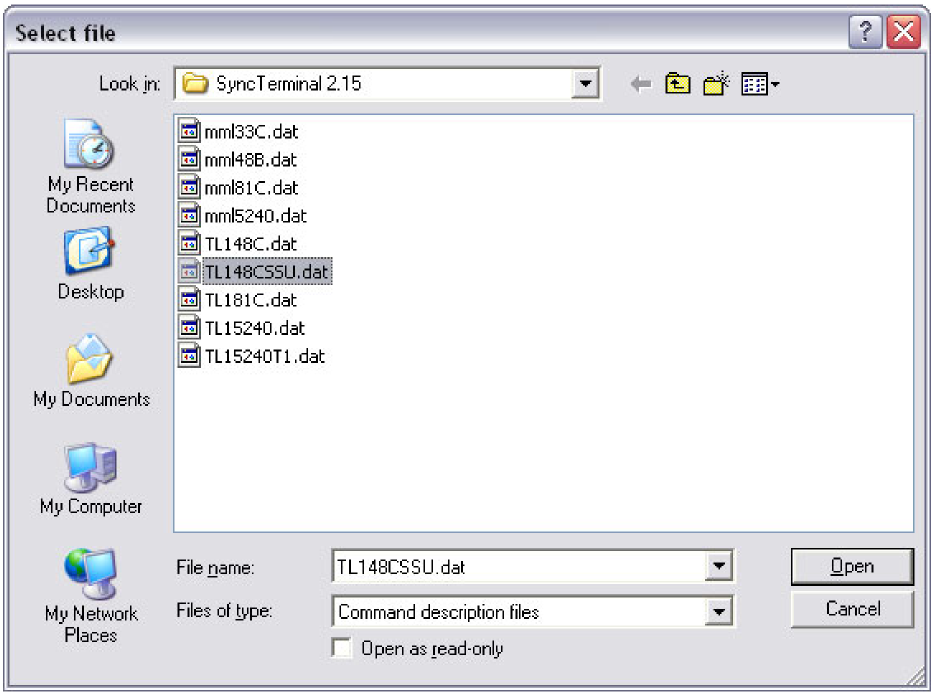
Note:

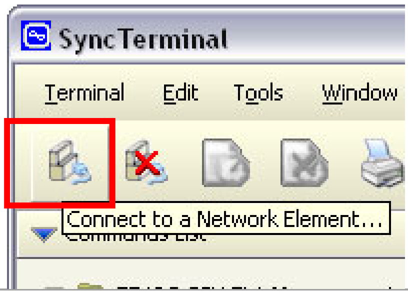
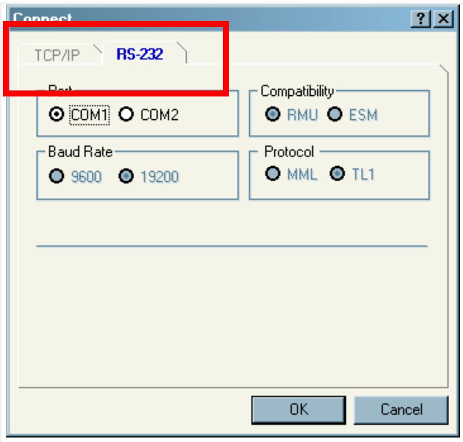
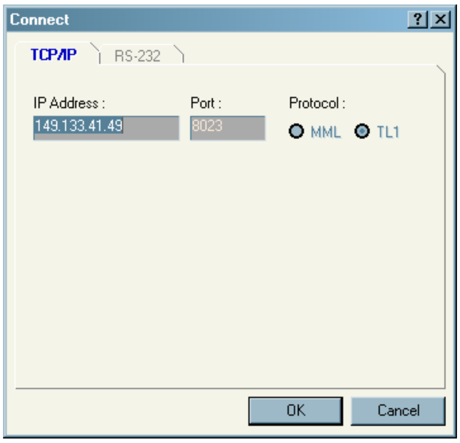
Please read section 6.2.1 and following before attempting to connect to the OSA 5548C SSU

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>1</td><td>Launch the SyncTerminal software</td></tr>
<tr><td>2</td><td>Go in the “Tools” menu and select “Option”

</td></tr>
<tr><td>3</td><td>Click on the tab labelled “Protocol”</td></tr>
</table>

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td></td><td>
</td></tr>
<tr><td>4</td><td>Select the 5548C in the “Select Shelf” list.

</td></tr>
<tr><td>5</td><td>Select TL1 and press the button with “…” to browse the computer in order to find the corresponding data file “*.dat”</td></tr>
</table>

STEP	ACTION
	
6	Select the corresponding file, which should be as shown below (TL148CSSU.dat) and press the button "Open" 
7	Then press "OK"

STEP	ACTION
8	For prerequisites for local serial RS-232 connection, refer to section 6.2.3 and for remote Ethernet connection, refer to section 6.2.4.  Press the “Connect” button
9	 **For Local RS232 connection:** Click on the tab named “RS-232” and select your computer’s serial port it is needed to use (COM1 or COM2) to access the OSA 5548C. Other parameters are automatically configured.  **For Remote Ethernet connection:** Before attempting to access the 5548C shelf the first time remotely, it is required configure its network parameters via local RS-232 management. Go into the first tab labeled “TCP/IP” and enter the IP address configured in the shelf and the corresponding port.
10	Then click “OK”. When the connection has been correctly established, a new window should appear on the right part of the SyncTerminal window interface. When no connection can be established via TCP/IP, a message “`Connection failed !`” is prompted.

STEP	ACTION
	When no connection can be established via RS-232, although there is no connection, it is written "`Connected`" as the SyncTerminal detects the computer serial port, but it is not able to send command.

Procedure 6-5 SyncTerminal Communication Configuration and Set-up

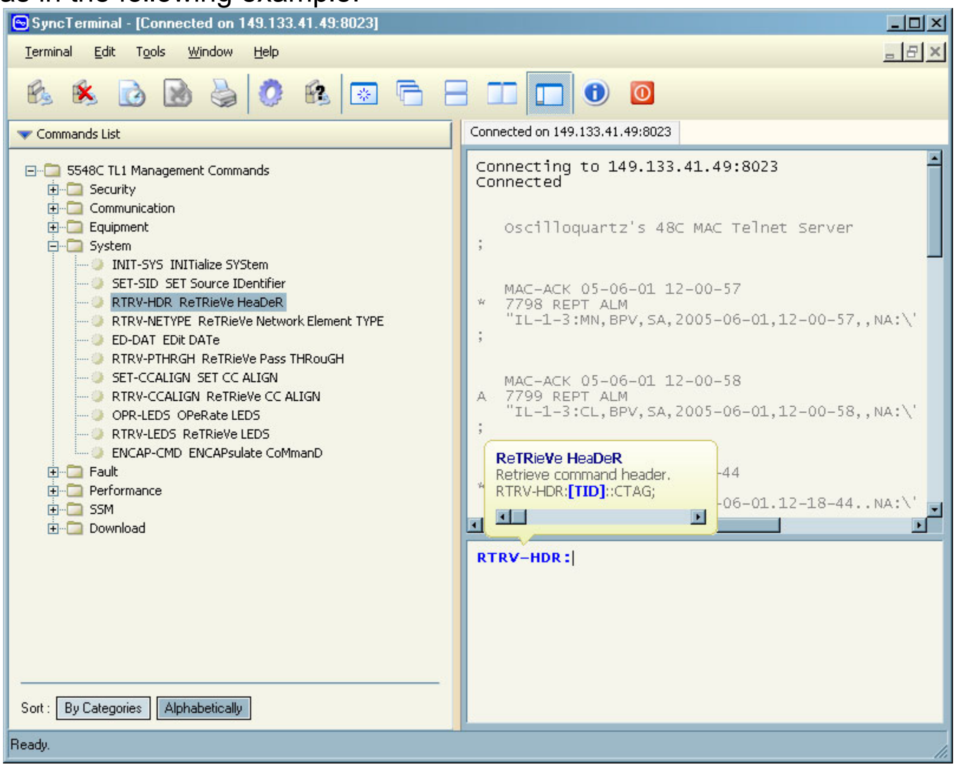
6.2.6.8 Typing TL1 commands

Note:

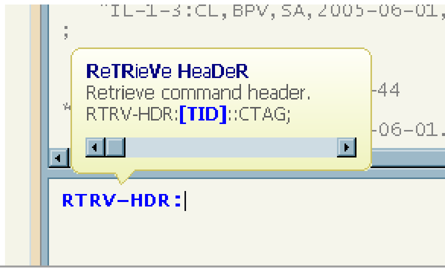
If the 5548C is being accessed for the first time, please refer to the previous sections for connection procedure and parameters.

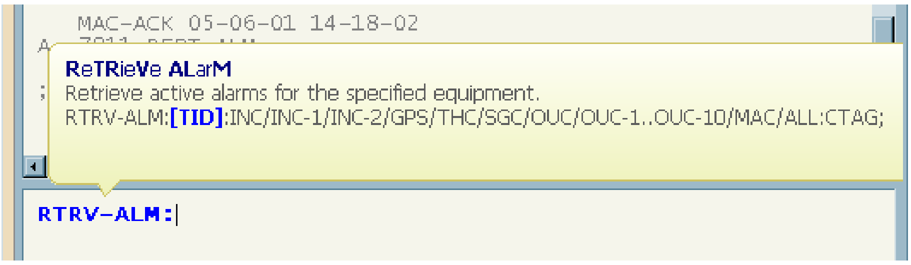
There are two ways to send commands from the SyncTerminal. To assist the operators who may be unfamiliar with the TL1 command set for the 5548C, use these steps described in the following procedure.
For those familiar with TL1 command set, the interface allows operators to type the command line directly into the bottom right area of the terminal screen.

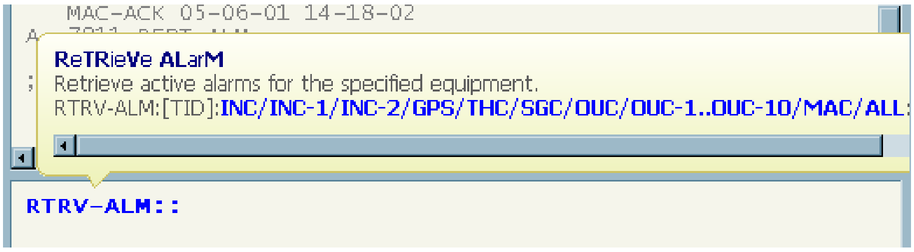
<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>1</td><td>The operator can launch the SyncTerminal and proceed to the 5548C connection (refer to the section 6.2.2)</td></tr>
<tr><td>2</td><td>The operator can select the command to send in the left part of the window, as in the following example.

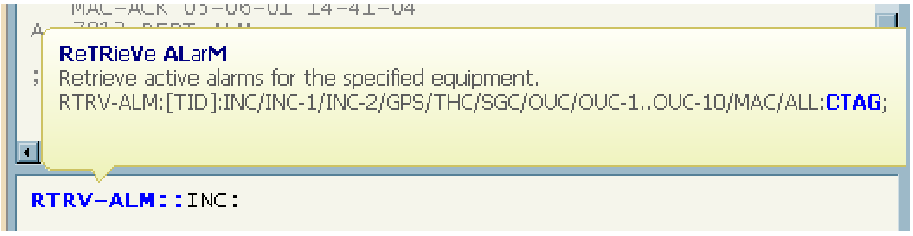


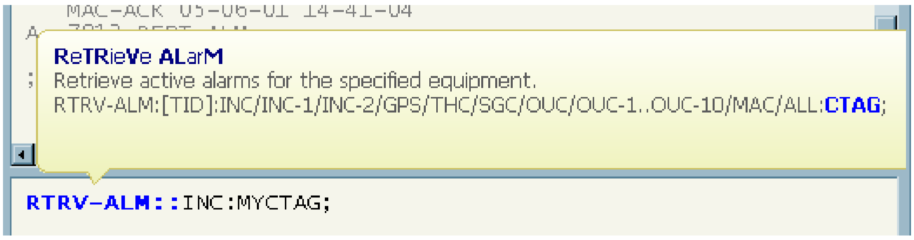
The command will appear in the right-bottom part with its description just</td></tr>
</table>

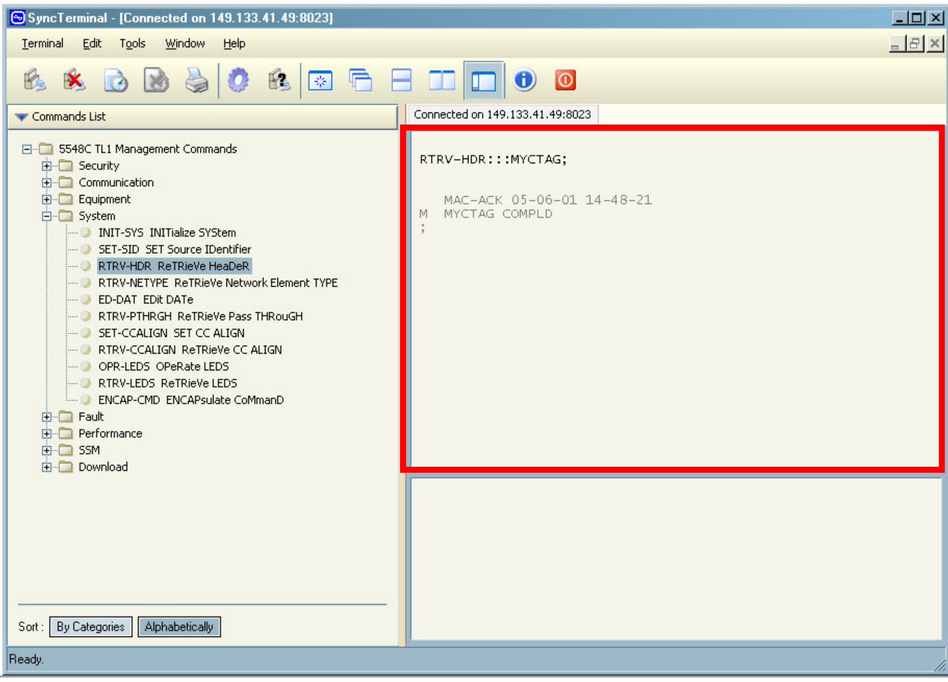
<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td></td><td>above in the balloon help window.</td></tr>
<tr><td>3</td><td>Copy the parameter as highlighted in boldface in the callout above the command area, using the full colon character as a delimiter, as shown in the example below.


For the TL1 handling, terms and abbreviations please refer to the section 6.2.1</td></tr>
<tr><td>4</td><td>While the operator types the TL1 command, sync terminal will move its callout window to assist the command completion:






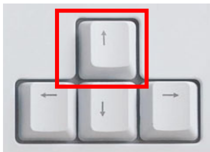
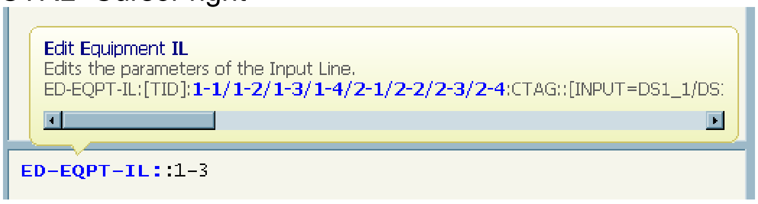
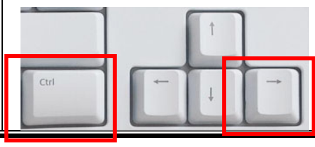

</td></tr>
<tr><td>5</td><td>Type the “;” semicolon to terminate the line and then press the “ENTER” key to send the command.</td></tr>
<tr><td>6</td><td>The 5548C should respond in the right of the window, as follows:</td></tr>
</table>

STEP	ACTION
	

Procedure 6-6 Typing TL1 Commands

6.2.6.9 Keyboard Shortcuts for Typing TL1 Commands

The SyncTerminal interface uses tips and shortcuts to assist the user with TL1 command.

Shortcut Function & Description	Keyboard vision
Repeat a previous command To repeat a previously typed TL1 command, the operator can press the top cursor one time if it is required to repeat the previous command. Or as many times as he wants want to retrieve past typed TL1 commands	
Select a parameter in the callout To select a parameter in a long list of available parameters, as in the picture below, press the keys CTRL+Cursor right 	
Select an optional configuration parameter in the callout When setting one of the optional parameters in a TL1	

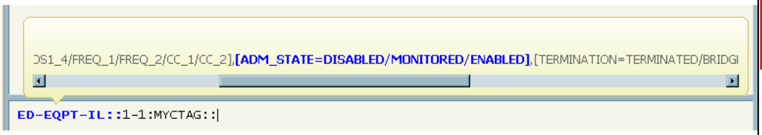
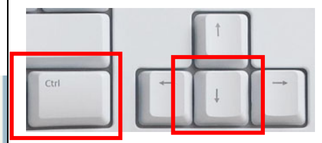
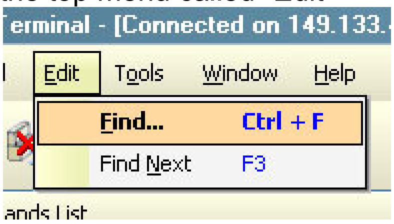
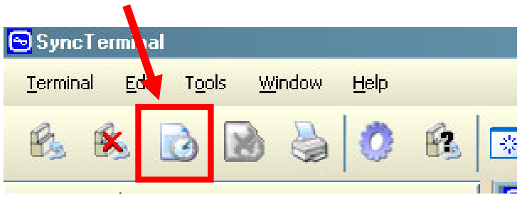
command, as in the example below, the operator can press CTRL+Cursor right to choose it and CTRL+Cursor down to select it.  Once selected, the operator can press CTRL+Cursor right, to choose a setting in the list of suggestions.	 
Finding a string in the previous responses To find information among the previous responses, the operator can press the keys CTRL+F or select the item in the top menu called "Edit"  	

Table 6-8 Keyboard Shortcuts for Typing TL1 Commands

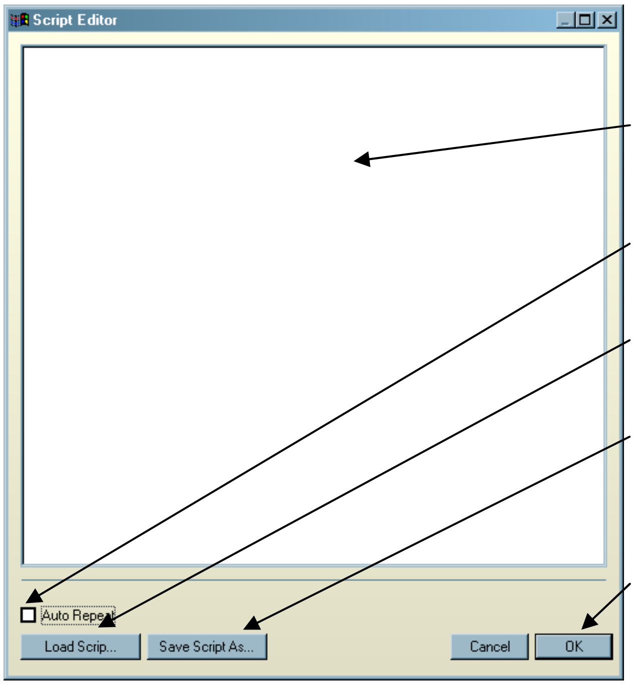
6.2.6.10 Making TL1 Command Scripts

It is possible to create a sequence of TL1 commands to avoid retyping the same sequence of commands.

Press the button below.



The following window appears allowing to enter sequence of commands.



This is the command editor to write the commands script

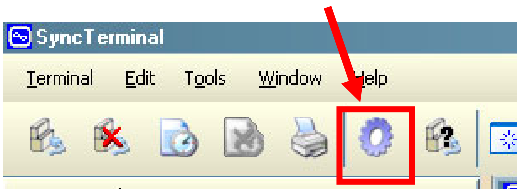
Check this box to repeat the script continuously once launched

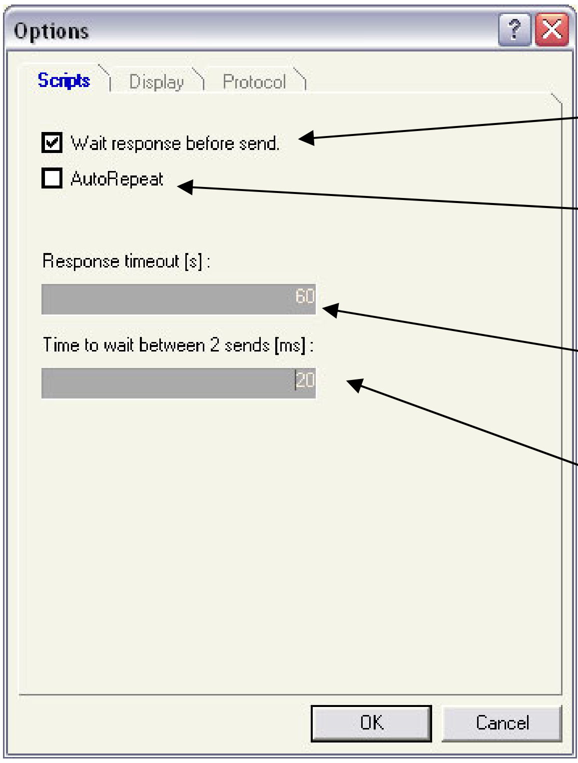
To load a script press this button and browse the computer

Press this button to save a script in any place on your computer

Once the script is ready, run it pressing the button ok

To avoid overwhelming the MAC card with too many commands too quickly, Oscilloquartz recommends adding delay between commands. To set a delay between commands, press the button shown below.





This check box should be checked to delay the script before sending another command

When checked, the AutoRepeat feature automatically repeats the script when executed until halted by the user

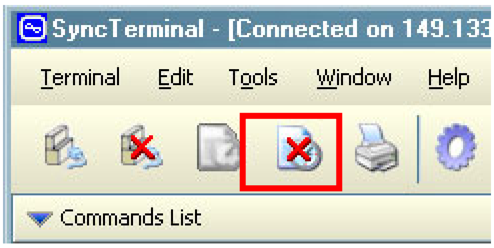
This is the delay before stoping the script when no response is received

This is the delay between two commands within the script

<u>Example of script:</u>
To retrieve all the input line parameters, create the following script.

```
RTRV-EQPT-IL::1-1:MYCTAG;
RTRV-EQPT-IL::1-2:MYCTAG;
RTRV-EQPT-IL::1-3:MYCTAG;
RTRV-EQPT-IL::1-4:MYCTAG;
```

To stop the script, you can simply press the below button.



6.3 Security Management

6.3.1 Introduction

This chapter describes the parameters and functions available to manage the user security and rights to access the OSA 5548C SSU management system.
Prior to sending any command to the 5548C, it is required to log into the 5548C management system with a username (UID) and password (PID).

When attempting to log the shelf at the first time, it is necessary to use the default username and password.

It is also possible to create different user rights according to restriction required to supply to operators. However, at least one user account with full rights is obligatory.

6.3.2 Default Username (UID) and Password (PID)

At the first attempt, it is required to use the default username and password, which are the following:

UID: **OSCILLOQUARTZ**
PID: **OSA**

Recommendation:

Oscilloquartz recommends creation of a user account and removal of the default for security. Securely record all new account creations.

6.3.3 Login to the 5548C

The following TL1 command is required to log into the shelf.

Input Syntax

```
ACT-USER::aid:ctag::pid;
```

Example:

```
ACT-USER::OSCILLOQUARTZ:MYCTAG::***;
```

The response should be:

Output Syntax

```
       sid   date  time
M      ctag  COMPLD
      "aid:last_time,attempts"
;
```

Parameter name	Default Parameter	Possible configurations	Description
AID	OSCILLOQUARTZ		Login or Username (UID)
PID	OSA	Any ASCII string (excluding those characters that represent TL1 syntax) of up to 10 characters.	User password.
LAST_TIME*		2004-01-01…2099-12-31 00-00-00…23-59-59	Date and Time of the last session established by this user.
ATTEMPTS*		0…99	Number of unsuccessful session attempts since last session

* Not software configurable

Note:

By default, once logged, when no command is sent during 10 minutes, the session closes automatically for security.

The following automatic message format is prompted:

```
       sid date time
almcde ctag CANC
;
```

6.3.4 Logout the 5548C

6.3.4.1 User Logout

When user needs to end the session, the following command is required:

Input Syntax

```
CANC-USER::aid:ctag;
```

Example:

```
CANC-USER::OSCILLOQUARTZ:MYCTAG;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)

6.3.4.2 Logout User from an Administrator Account

An admistrator can logout a user with the following command.

Input Syntax

```
CANC-USER-SECU::aid:ctag;
```

Example:

```
CANC-USER-SECU::USER1:MYCTAG;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID) of the user being logged

6.3.5 Password Modification

6.3.5.1 Own User Password Modification

The user can modify his password with the following command.

Input Syntax

```
ED-PID::aid:ctag::oldpid,newpid;
```

Example:

```
ED-PID::OSCILLOQUARTZ:ctag::OSA,MYNEWPWD;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)
OLDPID			Current Password
NEWPID		Any ASCII string (excluding those characters that represent TL1 syntax) of up to 10 characters.	New password

6.3.5.2 Modifying an User's Password by an Administror

The administrator can modify anuser password with the following command.

Input Syntax

```
ED-SECU-PID::aid:ctag::oldpid,newpid;
```

Example:

```
ED-SECU-PID::OSCILLOQUARTZ:MYCTAG::OSA,HISNEWPWD;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)
OLDPID			Current Password
NEWPID		Any ASCII string (excluding those characters that represent TL1 syntax) of up to 10 characters.	New password

6.3.6 User Account Management

6.3.6.1 Parameters

The following parameters can be configured in every User account.

UID: User name of the user account.

PID: Password of the user account.

CID: A list of up to 25 ports allowed for the user. It can be RS-232 front and/or rear and/or Ethernet Ports.

UAP*: *This parameter is related to the user privileges.*

PAGE*: *Password ageing interval. It is the number of days after which the user receives a prompt indicating that it is necessary to change his password.*

PCND*: *This is an intervall signifying the number of days that a user can use the existing password before an update becomes mandatory.*

PCNN*: *This is the number of time before an user must change his password.*

POINT*: *When the user receives a prompt to change his password, no old password can be restored unless the POINT interval expires.*

UOUT*: *At the end of the UOUT interval the user account is disabled if the user has never been used to set up a session.*

LSTOI*: *Normally used to set what is accessible to the user. This parameter is required by Telcordia GR, but not used with the 5548C.*

Note:

*: The parameters in *ITALIC* are not implemented. Oscilloquartz will introduce them upon customer specific security requirements.

6.3.6.2 Create a New User Account

To create a new user account, the following command is required.

Input Syntax

```
ENT-USER-SECU::aid:ctag::pid,cid,uap:[PAGE=page],[PCND=pcnd],[PCNN=pcnn],[POINT=point],[UOUT=uout],[LSTOI=lstoi];
```

Example:

```
ENT-USER-SECU::USERNAME:MYCTAG::PASSWORD,8000&8023&RS-FRONT&RS-REAR,X:PAGE=90,PCND=7,PCNN=5;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)
PID		Any ASCII string (excluding those characters that represent TL1 syntax) of up to 10 characters.	Password
CID		0000…9999, RS-FRONT, RS-REAR. Each port separated with a "&". i.e. in the format of: 8023&8024&RS-FRONT	A list of up to 25 ports or channels. When a session initiation request is received, the NE checks the CID of the session request against the CID as stoerd in the NE. RS-FRONT is the RS-232 port on the MAC. RS-REAR is the RS-232 port on the Management tile.
UAP			*Password Aging Intervall in days. At the end of this intervall, the user receives a prompt that the existing password has to be replaced with a new one.*
PAGE	*90*	*30..999*	*Password Aging Intervall in days. At the end of this intervall, the user receives a prompt that the existing password has to be replaced with a new one.*
PCND	*7*	*1..999*	*This is an intervall signifying the*

Parameter name	Default Parameter	Possible configurations	Description
			number of days that a user can use the existing password before an update becomes mandatory. It is typically 5 to 10 days.
PCNN	*5*	*1..999*	*This is an integer signifying the number of times that an user can use the existing password before an update becomes mandatory. Typically it is 3 to 5 times.*
POINT	*180*	*1..999*	*Password Obsolescence Intervall in days. When a user receives a prompt to change the PID, no old PID can be restored unless the intervall POINT expires since that old PID became obsolete. Typically it is about 180*
UOUT	*60*	*1..999*	*UID Aging Intervall in days. At the end of this intervall the UID is disabled if during this intervall it has never been used to set up a session. Typically it is between 45 and 90.*
LSTOI		*IDENTIFIERS*	***NOT USED IN 5548C*** *List of Object Identifiers. These identifiers specify what is accessible to this UID. The list may indicate channels, commands. It may be a range, all objects, none. It is an application-dependant requirement*

6.3.6.3 Edit an User Account

To edit a new user account, the following command is required.

Input Syntax

```
ED-USER-
SECU::AID:CTAG::[newpid],[newpid],[cid],[uap]:[PAGE=page],[PCND
=pcnd],[PCNN=pcnn],[POINT=point],[UOUT=uout],[LSTOI=lstoi];
```

Example:

```
ED-USER-SECU::USERNAME:MYCTAG::NEWUSERNAME,NEWPASSWORD,8023&RS-
FRONT&RS-REAR,X:PAGE=90;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)
NEWUID			New Username (UID)
NEWPID		Any ASCII string (excluding those characters that represent TL1 syntax) of up to 10 characters.	New Password (PID)
CID		0000…9999, RS-FRONT, RS-REAR. Each port separated with a “&”. i.e. in the format of: 8023&8024&RS-FRONT	A list of up to 25 ports or channels. When a session initiation request is received, the NE checks the CID of the session request against the CID as stoerd in the NE. RS-FRONT is the RS-232 port on the POWER B. RS-REAR is the RS-232 port on the Management tile.
UAP			*Password Aging Intervall in days. At the end of this intervall, the user receives a prompt that the existing password has to be replaced with a new one.*
PAGE	*90*	*30..999*	*Password Aging Intervall in days. At the end of this intervall, the user receives a prompt that the existing password has to be replaced with a new one.*
PCND	*7*	*1..999*	*This is an intervall signifying the number of days that a user can use the existing password before an update becomes mandatory. It is typically 5 to 10 days.*
PCNN	*5*	*1..999*	*This is an integer signifying the number of times that an user can use the existing password before an update becomes mandatory. Typically it is 3 to 5 times.*

Parameter name	Default Parameter	Possible configurations	Description

POINT	*180*	*1..999*	*Password Obsolescence Intervall in days. When a user receives a prompt to change the PID, no old PID can be restored unless the intervall POINT expires since that old PID became obsolete. Typically it is about 180*
UOUT	*60*	*1..999*	*UID Aging Intervall in days. At the end of this interval the UID is disabled if during this intervall it has never been used to set up a session. Typically it is between 45 and 90.*
LSTOI		*IDENTIFIERS*	***NOT USED IN 5548C*** *List of Object Identifiers. These identifiers specify what is accessible to this UID. The list may indicate channels, commands. It may be a range, all objects, none. It is an application-dependant requirement*

6.3.6.4 Retrieve User Account Parameters

To retrieve user account parameters, the following command is required.

Input Syntax

```
RTRV-USER::aid:ctag;
```

Example:

```
RTRV-USER::USERNAME:MYCTAG;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)
CID		0000…9999, RS-FRONT, RS-REAR. Each port separated with a “&”. i.e. in the format of: 8023&8024&RS-FRONT	A list of up to 25 ports or channels. When a session initiation request is received, the NE checks the CID of the session request against the CID as stored in the NE. RS-FRONT is the RS-232 port on the POWER B. RS-REAR is the RS-232 port on the Management tile.
UAP			*Password Aging Intervall in days. At the end of this intervall, the user receives a prompt that the existing password has to be replaced with a new one.*
PAGE	*90*	*30..999*	*Password Aging Intervall in days. At the end of this intervall, the user receives a prompt that the existing password has to be replaced with a new one.*

Parameter name	**Default Parameter**	**Possible configurations**	**Description**
PCND	*7*	*1..999*	*This is an intervall signifying the number of days that a user can use the existing password before an update becomes mandatory. It is typically 5 to 10 days.*
PCNN	*5*	*1..999*	*This is an integer signifying the number of times that an user can use the existing password before an update becomes mandatory. Typically it is 3 to 5 times.*
POINT	*180*	*1..999*	*Password Obsolescence Intervall in days. When a user receives a prompt to change the PID, no old PID can be restored unless the intervall POINT expires since that old PID became obsolete. Typically it is about 180*
UOUT	*60*	*1..999*	*UID Aging Intervall in days. At the end of this intervall the UID is disabled if during this intervall it has never been used to set up a session. Typically it is between 45 and 90.*
LSTOI		*IDENTIFIERS*	***NOT USED IN 5548C*** *List of Object Identifiers. These identifiers specify what is accessible to this UID. The list may indicate channels, commands. It may be a range, all objects, none. It is an application-dependant requirement*

6.3.6.5 Delete an User Account

To delete a user account, the following command is required.

Input Syntax

```
DLT-USER-SECU::aid:ctag;
```

Example:

```
DLT-USER-SECU::USERNAME:MYCTAG;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)

6.3.6.6 Disabling or Enabling an User Account

To disable an existing user without deleting the user account, the following command is required.

Input Syntax

```
INH-USER-SECU:::ctag::uid;
```

Example:

```
INH-USER-SECU:::MYCTAG::USERNAME;
```

To enable an existing user currently disabled, the following command is required.

Input Syntax

```
ALW-USER-SECU:::ctag::uid;
```

Example:

```
ALW-USER-SECU:::MYCTAG::USERNAME;
```

Parameter name	Default Parameter	Possible configurations	Description
AID			Login or Username (UID)

6.4 General Parameters and Information

This section contains general information and setting such as :

- Setting the 5548C's shelf name
- Setting the time and date
- Checking the inventory and retrieving the 5548C type information
- Checking card operation state
- Deleting a card for empty slots
- Swapping active card within a group (i.e. INC-A to INC-B)
- Initializing card firmware
- Lamp test
- LEDs status

6.4.1 Set the 5548C's Name

To set the network element's name, also called the source identifier, use the following command:

Input Syntax

```
SET-SID:::ctag::newsid;
```

Example:

```
SET-SID:::MYCTAG::MY5548C;
```

To retrieve the name, send the following TL1 command.

Input Syntax

```
RTRV-HDR:::ctag;
```

Note:

The name of the 5548C shelf should be displayed in the first line of the response after sending any command.

Parameter name	Default Parameter	Possible configurations	Description
NEWSID		A string limited to 20 Characters in the ranges "A" to "Z" and "0" to "9"	This is the source identifier of the 5548C

6.4.2 Time & Date

To set the time and the date in the 5548C, the following command can be sent.

6.4.2.1 Using TL1

Input Syntax

```
ED-DAT:::ctag:[date],[time],[utcoffset];
```

Example:

```
ED-DAT:::MYCTAG:2006-10-05,10-30-00,8-00;
```

Parameter name	**Default Parameter**	**Possible configurations**	**Description**
DATE		2004-01-01…2099-12-31	The date in the format of YYYY-MM-DD
TIME		00-00-00…23-59-59	The time in the format of HH-MM-SS
UTCOFFSET	02-00	-12-00…12-00	Offset between local time and UTC time in the format of HH-MM

6.4.2.2 Using SyncView PLUS

Open the *Physical* or *Logical view* and go to *View* → *Local Time*

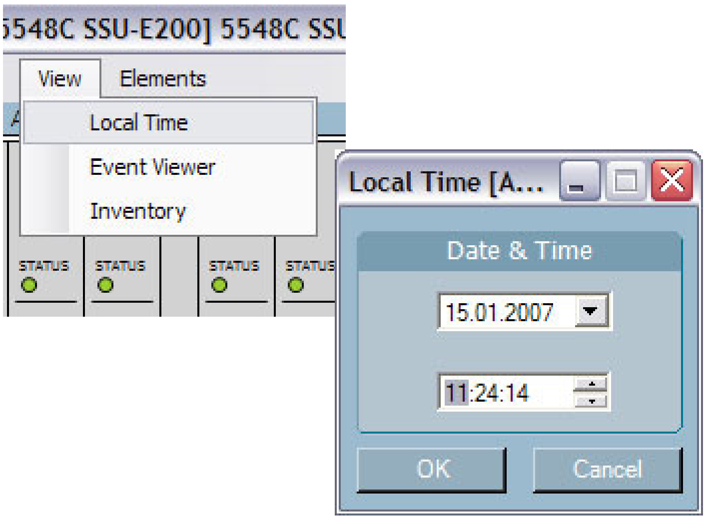


Figure 6-6: SyncView PLUS: time and date

6.4.3 5548C Type Information and Inventory

6.4.3.1 5548C Type Information

Physically
The model number (Mod.) the serial number (No.) and the order reference, also called part or article number, (Order ref.) can be found on the right side of the shelf and on the 5548C shelf's right ear.

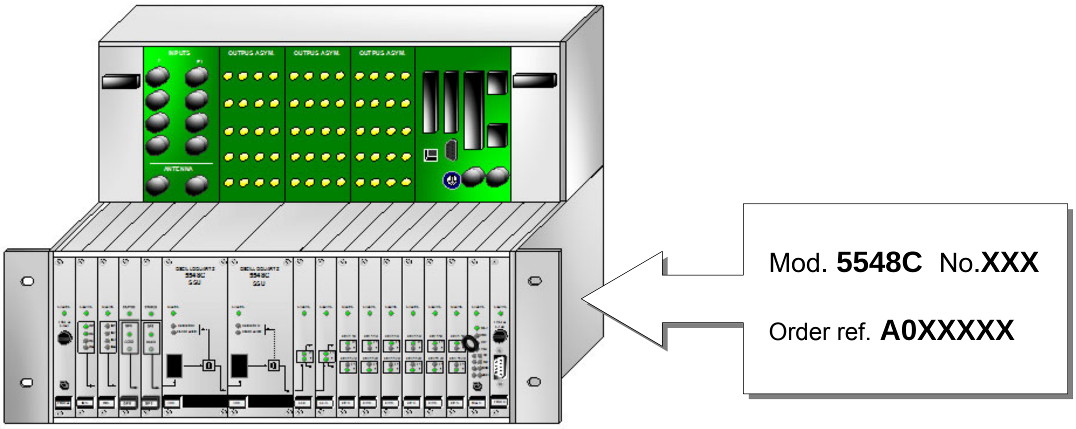


Figure 6-7 : 5548C - SSU Physical Type Information

Using TL1
Retrieve information about the product using the following command.

Input Syntax

```
RTRV-NETYPE:::ctag;
```

An answer similar to the following should be responded:

Output Syntax

```
        sid   date  time
M       ctag  COMPLD
      "vendor,model,netype,sw"
;
```

Parameter name	Range	Description
VENDOR	OSCILLOQUARTZ	This is the equipment vendor's name
MODEL	5548C	This is the equipment model's name
NETYPE	SSU	This is the equipment type
SW	01000…99999	This is the software release of the shelf

Table 6-9 5548C Type Information

To get the serial number of the shelf, the following command is required.

Input Syntax

```
RTRV-INV-SYS:::ctag;
```

The response should be:

Output Syntax

```
        sid  date time
M       ctag COMPLD
        "serial,shelftype"
;
```

Parameter name	Range	Description
SERIAL	100…4294967295	This is the equipment serial number
SHELFTYPE	SSU_L, SSU_S	OSA 5548C SSU type SSU_S: OSA 5548C SSU-E60 SSU_L: OSA 5548C SSU-E200

6.4.3.2 Inventory

Physically Inspection

Find the inventory of every single card at the following locations, illustrated below:

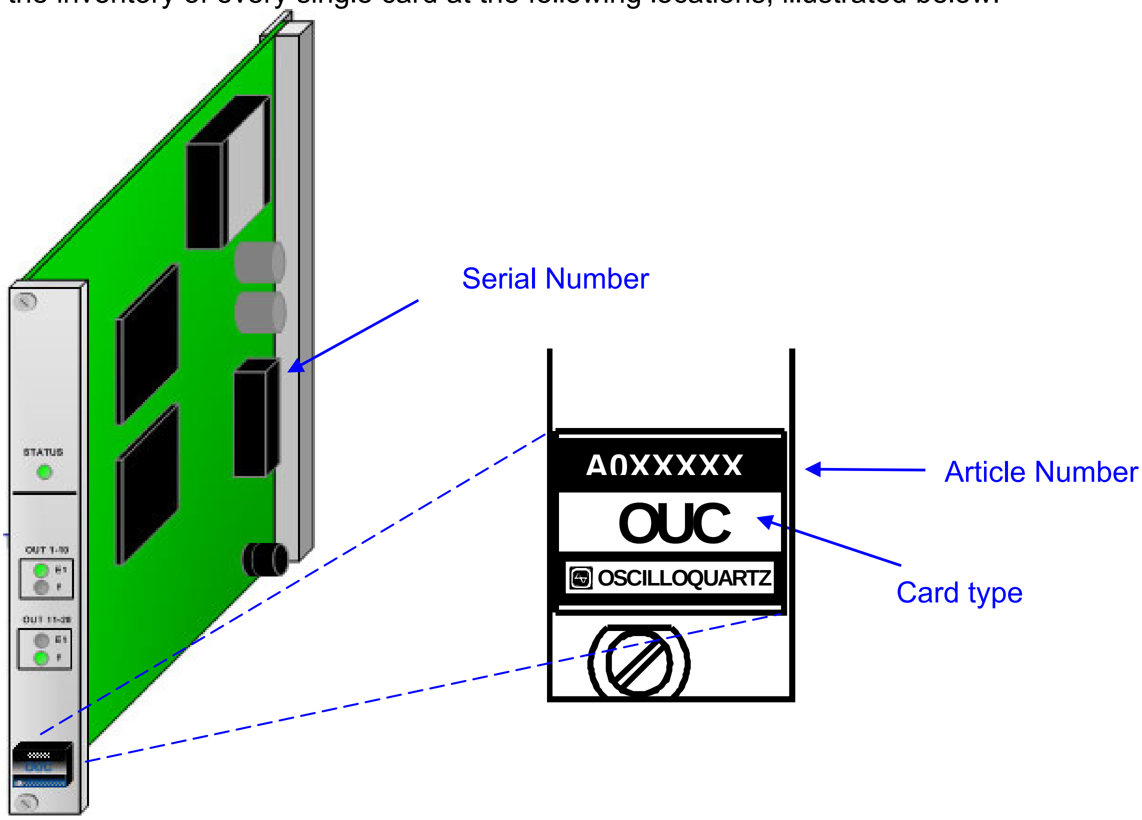


Figure 6-8 : Article Number & Card Type Location

Note:

The "A0xxxxx" number located on the connector is not the card's article number reference. Pleas refer to the "A0xxxxx" article number located on the bail handle.

Using TL1

With the following commands retrieve the inventory from either a single card, a group of cards or from all installed cards simultaneously.

Input Syntax

```
RTRV-INV::aid:ctag;
```

Example

```
RTRV-INV::INC-1-A:MYCTAG;
```

The response is formatted as below.

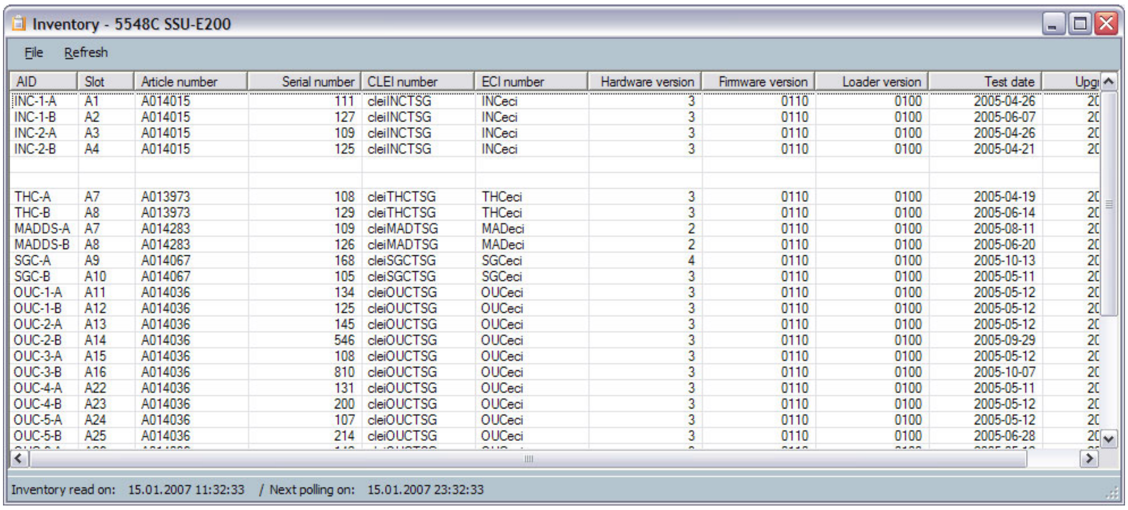
Output Syntax

```
       Sid   date  time
M      ctag  COMPLD
      "aid:slot,article,serial,clei,eci,hw,sw,ldr,
test,upgrade"
;
```

Parameter name	Possible configurations	Description
AID	INC, INC-1, INC-1-A, INC-1-B, GPS, GPS-A, GPS-B, THC, THC-A, THC-B, SGC, SGC-A, SGC-B, OUC, OUC-1…OUC-3, OUC-1-A…OUC-3-B, MAC, MAC-A, ALL	Abbreviation of the card, card group, card type or all cards. Refer to the section 6.2.1.3 for more details about abbreviations.
SLOT	A1…A37	Slot number
ARTICLE	0…4294967295	Article or part number
SERIAL	100…4294967295	Serial number
CLEI	ABCDEFG789	CLEI number
ECI	ABC123	ECI number
HW	1…9	Hardware version of the related card
SW	0001…9999	Software version embedded in the corresponding card
LDR	0001…9999	Loader version embedded in the corresponding card
TEST	2004-01-01…2099-12-31	Testing date
UPGRADE	2004-01-01…2099-12-31	Last software upgrade date

Using SyncView PLUS

Right Click on the element icon and select *Inventory*.



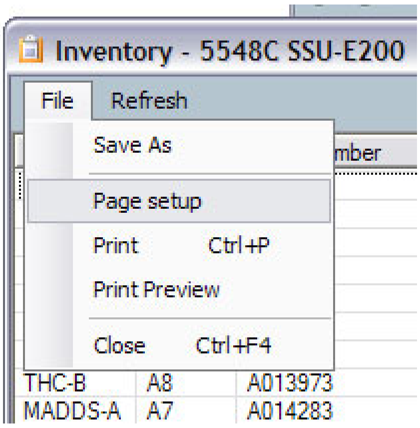
AID	Slot	Article number	Serial number	CLEI number	ECI number	Hardware version	Firmware version	Loader version	Test date
INC-1-A	A1	A014015	111	cleiINCTSG	INCeci	3	0110	0100	2005-04-26
INC-1-B	A2	A014015	127	cleiINCTSG	INCeci	3	0110	0100	2005-06-07
INC-2-A	A3	A014015	109	cleiINCTSG	INCeci	3	0110	0100	2005-04-26
INC-2-B	A4	A014015	125	cleiINCTSG	INCeci	3	0110	0100	2005-04-21
THC-A	A7	A013973	108	cleiTHCTSG	THCeci	3	0110	0100	2005-04-19
THC-B	A8	A013973	129	cleiTHCTSG	THCeci	3	0110	0100	2005-06-14
MADDS-A	A7	A014283	109	cleiMADTSG	MADeci	2	0110	0100	2005-08-11
MADDS-B	A8	A014283	126	cleiMADTSG	MADeci	2	0110	0100	2005-06-20
SGC-A	A9	A014067	168	cleiSGCTSG	SGCeci	4	0110	0100	2005-10-13
SGC-B	A10	A014067	105	cleiSGCTSG	SGCeci	3	0110	0100	2005-05-11
OUC-1-A	A11	A014036	134	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-12
OUC-1-B	A12	A014036	125	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-12
OUC-2-A	A13	A014036	145	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-12
OUC-2-B	A14	A014036	546	cleiOUCTSG	OUCeci	3	0110	0100	2005-09-29
OUC-3-A	A15	A014036	108	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-12
OUC-3-B	A16	A014036	810	cleiOUCTSG	OUCeci	3	0110	0100	2005-10-07
OUC-4-A	A22	A014036	131	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-11
OUC-4-B	A23	A014036	200	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-12
OUC-5-A	A24	A014036	107	cleiOUCTSG	OUCeci	3	0110	0100	2005-05-12
OUC-5-B	A25	A014036	214	cleiOUCTSG	OUCeci	3	0110	0100	2005-06-28

Figure 6-9: SyncView - Inventory

Via the *File* menu, the user can:

- save the inventory as a XML file
- print the inventory

The inventory is gathered once a day. The user can force a new synchronization of the Inventory of the shelf with the SyncView Database using the *Inventory* button.



Note:

The user can select the inventory list on and then copy with *CTRL+C* and paste in any document with *CTRL+V*

6.4.4 Checking the Card Operation States

There are 10 different states for each card or more precisely slots in the 5548C shelf, as below:

EMPTY: The card slot is empty. This is not considered as an alarm.
Remedial action: *Nothing except inserting a card in the slot.*

EXTRACTED: The card has been extracted from its respective slot. This is considered as an alarm.
Remedial action: *Reinserting the card in the slot or deleting the card with command shown in section 6.4.5.*

INIT: The card firmware is being restarted
Remedial action: *Wait for the completion of initialization.*

DOWNLOAD: The card firmware is being downloaded
Remedial action: *Waiting until the end of the download or aborting the download.*

OK: The card is ACTIVE and is working correctly
Remedial action: *No action required.*

STANDBY: The card is in STAND-BY and ready to protect the active card within the same group
Remedial action: *Should you need to activate the card which shows this status, please refer to section 6.4.5.2 in order to replace the active card with this one.*

ALARM: The card is in alarm
Remedial action: *Check the current alarm with the command RTRV-ALM and initiate corrective action accordingly.*

DEGRADED: The firmware version is different than the rest of the shelf
Remedial action: *Upgrade the card firmware with the firmware stored in the MAC cards.*

TESTERROR: Invalid testing date. The card has encountered a mismatching error about the date when it has been tested
Remedial action: *Contact your Oscilloquartz Customer Support service.*

DEAD: The MAC is not able to communicate with the card.
Remedial action: *Restart the card software and contact the Oscilloquartz Customer Support service.*

The following command is required to obtain the current state from any card or slot.

Input Syntax

```
RTRV-EQPT-OP::aid:ctag;
```

Example:

```
RTRV-EQPT-OP::INC-1-A:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
       sid  date time
M      ctag COMPLD
       "aid:opstate"
;
```

Parameter name	Possible configurations	Default	Description
AID	INC-1-A…INC-1-B, GPS-A, GPS-B, THC-A, THC-B, SGC-A, SGC-B, OUC-1-A…OUC-3-B, MAC-A		The specified card
OPSTATE	EMPTY, EXCTRACTED, INIT, DOWNLOAD, OK, STANDBY, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are different states: **EMPTY**: The card slot are empty **EXTRACTED**: The card has been extracted from its respective slot **INIT**: The card is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The card is ACTIVE and is working correctly **STANDBY**: The card is in STAND-BY and ready to protect the active card within the same group **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate with the card or group

6.4.5 Card Deleting for Empty Slot

Previously empty slots that are populated automatically update the inventory list. If a previously occupied card is removed from its slot, the OSA 5548C SSU will set an alarm called “IMPROPER REMOVAL”.

To avoid such alarms, you can set the corresponding slot to an empty state, using the following command.

Note:

It is not possible to DELETE or set an empty card state to an OCCUPIED slot.

6.4.5.1 Using TL1

Input Syntax

```
DLT-EQPT::aid:ctag;
```

Example:

```
DLT-EQPT::INC-1-B:ctag;
```

Parameter name	Possible configurations	Description
AID	INC-1-A, INC-1-B, GPS-A, GPS-B, THC-A, THC-B, SGC-A, SGC-B, OUC-1-A…OUC-3-B, MAC-A	Select the card’s slot you want to set as empty

6.4.5.2 Using SyncView

Go to the *Physical View* → right-click on the empty slot shown in Black colour → *set empty*

6.4.6 Switching the Active Card within a Card Group

To enable a switch between the currently active and the inactive (stand-by) card (i.e. from THC-A to THC-B):

- Physically on the shelf, by removal of the active card from its slot.
- By software, with the following TL1 command.

Recommendation:

Switching INC, GPS and THC should be done during maintenance window period or before putting the 5548C in service as the output signal can be afftected with small phase jump.

6.4.6.1 Using TL1

Input Syntax

```
SW-DX::aid:ctag;
```

Example:

```
SW-DX::THC:MYCTAG;
```

For retrieving the current active card, the following command is required. Many parameters will be returned, with focus upon card **active** or **standby** status.

Input Syntax

```
RTRV-EQPT-OP::aid:ctag;
```

Example:

```
RTRV-EQPT-OP::THC:ctag;
```

The response is formatted as below.

Output Syntax

```
       sid  date time
M      ctag COMPLD
       “aid:opstate”
;
```

Parameter name	Possible configurations	Default	Description
AID	INC-1, GPS, THC		The specified card
OPSTATE	EMPTY, EXCTRACTED, INIT, DOWNLOAD, OK, STANDBY, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are different status: **EMPTY**: The card slot are empty **EXTRACTED**: The card has been extracted from its respective slot **INIT**: The card is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The card is ACTIVE and is working correctly **STANDBY**: The card is in STAND-BY and ready to protect the active card within the same group **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate

6.4.6.2 Using SyncView

Go to the *Physical View* → right-click on a protected pair of card (INC, GPS, THC) → *Switch*

6.4.7 Card Firmware Initialization

To re-initialize the firmware embedded in one of the 5548C's card, apply the TL1 command instructions below.

CAUTION

This command is SERVICE AFFECTING, and will require a consultation with a Customer Support & Services (CSS) representative to assess the potential of outage, and post-operation effects.

For those who are unfamiliar with this command, contact your local CSS for instructions, and always perform this command in MAINTENANCE WINDOW PERIOD.

Please read the below warning before doing any initialization

Important Recommendation

During input card initialization, Timing signals passing through a card are interrupted, and the card will not feed other cards.

To prevent service outage on the shelf during a firmware upgrade that causes INC initialization, Oscilloquartz recommends that a redundant card be utilized to prevent shelf outage.

In example:

To initialize the INC-1-A, verify that the INC-1-B protection (1:1) card is operational, and switch service to that protection twin prior to update or initialization of the active INC-1-A.

The system will avoid loss of synchronization service, in the following circumstances:

1. The active THC will run in holdover if a lone INC is initializing.
2. If only a single INC is installed in either INC-1-A or INC-1-B slots and either 2.048MHz or E1 signal is qualified by the INC, the shelf will enter in passthrough mode during THC initialization.
3. MAC card initialization does not affect shelf synchronization functions.

Input Syntax

```
INIT-SYS::aid:ctag::restart;
```

Example:

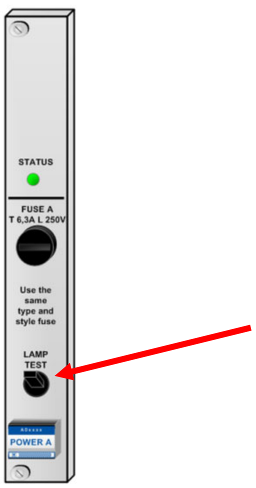
```
INIT-SYS::THC-A:MYCTAG::WARM;
```

Parameter name	Possible configurations	Description
AID	INC-1-A, INC-1-B, GPS-A, GPS-B, THC-A, THC-B, SGC-A, SGC-B, OUC-1-A…OUC-3-B, MAC-A, ALL	Select the card's slot you want to set as empty
RESTART	COLD, WARM	There are two type of restart: COLD: is a restart with factory default card(s) settings WARM: is a restart which maintains the current card(s) settings

6.4.8 Testing all the Cards' LEDs

There are two ways to test the 5548C SSU's cards' LEDs, described in the following two sections.

6.4.8.1 Physical Lamp Test on the Shelf



Physically there is a pushbutton on the POWER A (slot A21) card labeled “LAMP TEST"

Figure 6-10 : Physical Lamp Test

Once the LAMP TEST switch is pressed, follow the LAMP TEST sequence in section 6.4.8.3

6.4.8.2 Lamp Test Using Software

The following TL1 command will have the same effect as pressing the LAMP TEST switch on the shelf.

Input Syntax

```
OPR-LEDS:::ctag;
```

Once the LAMP TEST command sent, where it is possible to see the shelf physically, follow the LAMP TEST sequence in section 6.4.8.3 that describes point by point what the shelf is supposed to do.

6.4.8.3 Lamp Test Sequence

Once the LAMP TEST switch has been pressed or the command OPR-LEDS has been sent, the 5548C will react as follow. The lamp test takes approximately 10 seconds.

Seq.	DESCRIPTION
1	All LEDs are lit, and bicolor LEDs in RED for 5 seconds
2	The bicolor LEDs are Green for 5 more seconds while monocolor LEDs remain lit
3	All LED are restored on their previous state

Table 6-10 Lamp Test Sequence

6.5 Input Line (IL) Properties & INput Card (INC) Configurations

6.5.1 Introduction

The OSA 5548C has the capability to connect up to 4 Input lines among 8 input connectors (4 for E1 signal and 4 for Frequency). There are also 2 connectors to connect up to two GPS antennas to get an additional PRS quality input line when GPS cards are locked on GPS signal.

The 5548C allows several customizable configurations for each IL and INC:

- **Inut Card state**
  To retrieve the current INC state
- **Input port(s) assignment:**
  To assign any port connector to an input line.
- **Enabling/Disabling or Monitoring a line:**
  To enable a new line, to disable a line or to monitor an input signal without allowing the OSA 5548C to select it.
- **Configuring a line as terminated or bridged:**
  To select the type of hardware connection.
- **E1 signal configuration:**
  To configure the E1 signal corresponding to the signal fed.
- **Adding a restore delay once a line is detected as valid:**
  To delay the premature selection of an input source that is in the process of recovery.

6.5.2 Retrieving General INput Card (INC) Group Status

This section explains how to retrieve the configuration of each INC group.

Important Note:

The command response refers to the INC group status and not to individual INC card status.

Input Syntax

```
RTRV-EQPT-INC:aid:ctag;
```

Example:

```
RTRV-EQPT-INC:1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
        sid   date  time
 M      ctag  COMPLD

        "aid:opstate:SSM=ssm,PERF=perf,SYS_MODE=sys_mode"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1		This is the INC group number
OPSTATE	EMPTY, EXCTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are different INC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from their respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SSM	OFF, ON	OFF	Indicates if the SSM is ON or OFF
PERF	OFF, ON, ALARM	ON	Indicates if the PERFORMANCE MEASUREMENT is activated, deactivated or in alarm
SYS_MODE	MST, EXP, INV	MST	5548C system mode. MST: MASTER shelf; EXP: EXPANSION shelf; INV: Invalid

6.5.3 Input connector to Input Line (IL) description

The OSA 5548C allows configuration of up to 5 inputs from two groups of 4 inputs plus 1 input from any of the GPS input ports.

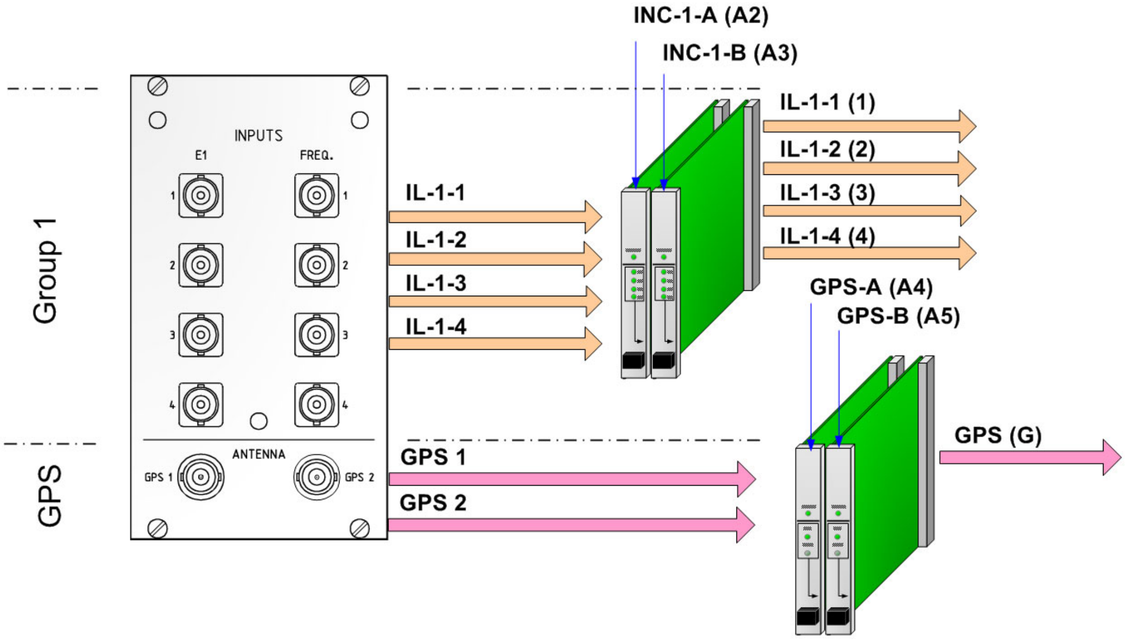


Figure 6-11 : Input Connector Assignment

The arrows on the above figure are the Input Lines (IL), which are “virtual” lines between connectors and INput Cards (INC). The IL are configurable with TL1 commands.

Each INC can be configured to connect to any of the 8 ports within that group through the IL.

Example:
The operator can assign IL-1-2, which is the second IL of the INC group 1 to Input connectors E1 #1 to #4 or input connectors FREQ. #1 to #4.

Note:

Although multiple logical inputs can be mapped to the same physical one, user shall be aware that the physical configuration is unique. In other terms, if two or more logical inputs share the same physical connector, only one configuration is possible.
For example, if IL-1-1 and IL-1-2 are both mapped to use the entry E1-1, then the SSM configuration MUST be the same.

With respect to group configuration, this chart describes all of the possible configurations.

Group	**Port number**	**Input Port Abbreviation**		**Input line abbreviation** (GROUP-LINE)	**Cards**
Input Group	E1 IN1	E1_1	Up to 4 input ports selectable	1-1	**INC-1-A (A2) & INC-1-B (A3)**
	E1 IN2	E1_2			
	E1 IN3	E1_3		1-2	
	E1 IN4	E1_4			
	f IN1	FREQ_1		1-3	
	f IN2	FREQ_2			
	f IN3	FREQ_3		1-4	
	f IN4	FREQ_4			
GPS	GPS 1	GPS	1 input port	GPS	**GPS-A (A4) & GPS-B (A5)**
	GPS 2				

Table 6-11 Possible Input Configurations

6.5.4 Input Line (IL) Configuration

This section describes how to retrieve and how to configure the configuration for the Input lines in a global view. To learn about every single parameter, follow the next sections.

Note:

Read section **Input connector to Input Line (IL) description 6.5.3** to understand the concept of cross connection of input lines to physical input ports.

Using TL1

Input Syntax

```
RTRV-EQPT-IL:aid:ctag;
```

Example:

```
RTRV-EQPT-IL:1-1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
M     ctag  COMPLD

"aid:opstate,ssm,INPUT=input,ADM_STATE=adm_state,TERM=term,
CODE=code,WTR=wtr,FRCD=frcd,OOF_DETECT=oof_detect,
CRC4_DETECT=crc4_detect,BPV_DETECT=bpv_detect,SA4=sa4,
SA5=sa5,SA6=sa6,SA7=sa7,SA8=sa8,FREQ=freq,TAG=tag"
;
```

To edit all configurations in one single line, the following command is required.

Input Syntax

```
ED-EQPT-IL:: aid:ctag::[INPUT=input],[ADM_STATE=adm_state],
[TERMINATION=termination],[CODE=code],[WTR=wtr],
[OOF_DETECT=oof_detect],[FRCD=frcd],[CRC4_DETECT=crc4_detect],
[BPV_DETECT=bpv_detect],[SSM_BIT=ssm_bit],[TAG=tag];
```

Example:

```
ED-EQPT-IL::1-2:MYCTAG::INPUT=E1_2,ADM_STATE=ENABLED,
TERMINATION=TERMINATED,CODE=HDB3, WTR=1,
OOF_DETECT=ENABLED,FRCD=NONE,CRC4_DETECT=DISABLED,
BPV_DETECT=DISABLED,SSM_BIT=SA4,TAG="My Second E1 Input Line";
```

Parameter name	**Possible configurations**	**Default parameters**	**Description**
AID	1-1…1-4, ALL*		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
OPSTATE*	OK, ALARM, WTR, PERFALARM	OK	There are different operational input line states: OK: The line is running correctly ALARM: The line is in alarm WTR: The line is being in wait-to-restore time mode PERFALARM: The line's performance crosses the threshold
SSM*	PRC, SSU_A , SSU_B, SEC, DNU, NONE, FAILED, DISABLED	NONE	This is the input line SSM quality
INPUT	E1_1, E1_2, E1_3, E1_4, FREQ_1, FREQ_2, FREQ_3, FREQ_4		This is the port/connector assigned to the Input Line (IL).
ADM_STATE	DISABLED, MONITORED, ENABLED	ENABLED	This is the status of the line: DISABLED: The input line is disabled and hence cannot be selected by the 5548C. MONITORED: The line is monitored but cannot be selected as reference by the 5548C. ENABLED: The line is enabled and can be selected by the 5548C
TERMINATION	TERMINATED, BRIDGED, UNK*	TERMINATED	Input connector connection type
CODE	HDB3, AMI	HDB3	Code type of the E1 signal
WTR	DISABLED, 1…12	DISABLED	This is the delay in minutes before that the 5548C is allowed to select an input line recovered
FRCD	PRC, SSU_A , SSU_B, SEC, DNU, NONE	NONE	This is the forced SSM quality set for the corresponding line
OOF_DETECT	DISABLED, ENABLED, 10-4, 10-3, 10-2	ENABLED	Determine whether an Out Of Frame alarm should be detected and generated or not. 10-4, 10-3 or 10-2 corresponds to the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2). In that case, an alarm is produced when false words rate of the total number (4000) during 1s, is higher or equal than the selected Threshold.

Parameter name	Possible configurations	Default parameters	Description
CRC4_DETECT	DISABLED, ENABLED, 10-4, 10-3, 10-2	DISABLED	Determine whether an CRC-4 alarm should be detected and generated or not. 10-4, 10-3 & 10-2 corresponds to the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2) In that case, an alarm is produced when false CRC-4 values rate of the total number (1000) during 1s, is higher or equal than the selected Threshold.
BPV_DETECT	DISABLED, ENABLED, 10-4, 10-3, 10-2	DISABLED	Determine whether a Bipolar Violation (BPV) alarm when using AMI code or Code Violation alarm when using HDB3 code should be detected and generated or not. 10-4, 10-3 & 10-2 corresponds to the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2). In that case, an alarm is produced when BPV or CV rate of the total number ($2.048E^6$) during 1s, is higher or equal than the selected Threshold.
SA4*	OFF, ON, SSM		Value of the Sa4 bit
SA5*	OFF, ON, SSM		Value of the Sa5 bit
SA6*	OFF, ON, SSM		Value of the Sa6 bit
SA7*	OFF, ON, SSM		Value of the Sa7 bit
SA8*	OFF, ON, SSM		Value of the Sa8 bit
SSM_BIT	SA4, SA5, SA6, SA7, SA8, NONE	SA4	Sa bit used to transmit the SSM quality
FREQ *	2.048M, 5M, 10M, INVALID	2.048M	If the line is assigned to a frequency input, this is the frequency detected by the INC
TAG	"My Tag with up to 32 chars."		Double quoted tag. Up to 32 characters, alphabetic upper and lower case, numeric and punctuation.

* Not configurable with software

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *Input 1…4* → *Details*

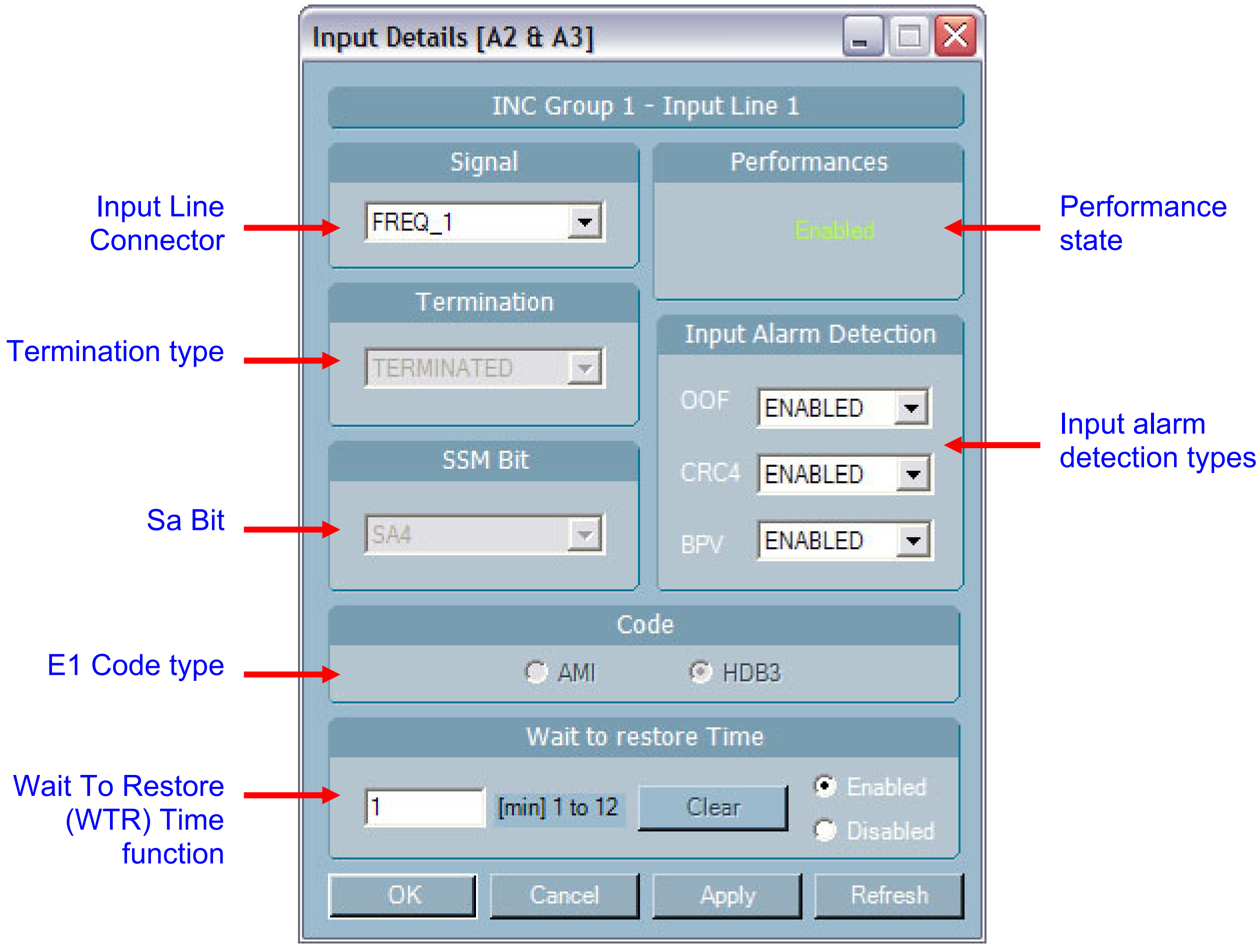


Figure 6-12: SyncView: Input Configuration Window

6.5.4.1 Input Connector Assignment

Note:

To retrieve current IL configuration, refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross connection of input lines to physical input ports.

Recommendation:

We recommend using any of the Input Connectors number 1 (E1_1 or FREQ_1) for Input Line (IL) 1, Input Connector 2 for IL 2, Input Connector 3 for IL3 and Input Connector 4 for IL 4.

So the user knows what Input Line corresponds to what connector without the need to access the shelf with software for retrieving and knowing current Input configuration.

Using TL1

To assign an input line to any connector in the related group, the following command can be sent.

Input Syntax

```
ED-EQPT-IL::aid:ctag::INPUT=input;
```

Example:

```
ED-EQPT-IL::1-3:MYCTAG::INPUT=E1_3;
```

Parameter name	Possible configurations	Description
AID	1-1…1-4	This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
INPUT	E1_1, E1_2, E1_3, E1_4, FREQ_1, FREQ_2, FREQ_3, FREQ_4	This is the port/connector assigned to the related line.

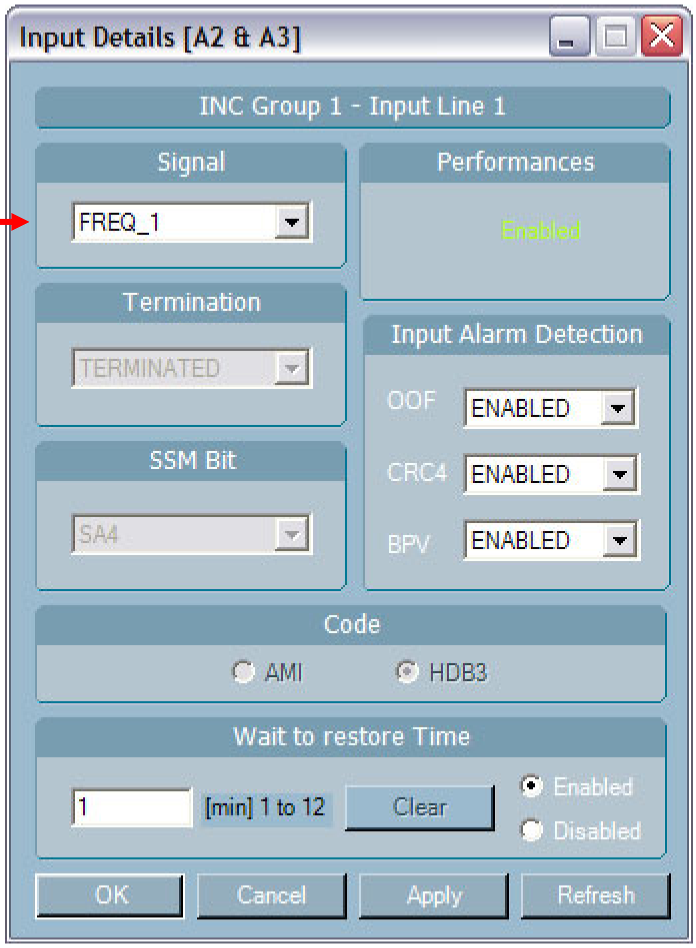
Table 6-12 Input Line Editing Setting

> **Important:**
>
> We do not recommend selecting the same input connector to more than one input line (IL) for evident reason of operation reliability.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *Input 1…4* → *Details* → *Signal*

Input Line Connector



Select the input type to be applied on the specified line.

- FREQ_1 to 4 are the Frequency connectors (2.048, 5, 10 MHz)
- E1_1 to 4 are the E1 connectors. (2.048 Mbit/s)

Figure 6-13: SyncView: Input Type configuration Window

6.5.4.2 Enabling, Disabling or Monitoring an Input Line

Disable any unused Input Lines to avoid alarms.
Use the Monitoring function to assess an Input Line prior to enabling that line into service.
The following example demonstrates the administration states of Enabled, Disabled and Monitored on any input line.

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross conection of input lines to physical input ports.

Input Syntax

```
ED-EQPT-IL::aid:ctag::ADM_STATE=adm_state;
```

Example:

```
ED-EQPT-IL::1-3:MYCTAG::ADM_STATE=ENABLED;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
ADM_STATE	DISABLED, MONITORED, ENABLED	ENABLED	This is the administrative state of the line: DISABLED: The input line is disabled and hence cannot be selected by the 5548C. MONITORED: The line is monitored but cannot be selected by the 5548C. ENABLED: The line is enabled and hence, can be taken by the 5548C

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Input 1…4* → *Enabled* / *Disabled* / *Monitored*

6.5.4.3 Input Line Termination

It is important to set the input line termination before using its signal because it selects the corresponding input impedance.

Bridging
Configuration for derived input connection (-20dB). The input impedance is 1k ohms. In Example, the E1 traffic line IN and OUT is connected in parallel to the same input connector.

Terminating
The input cable is terminated by the 5548C with an impedance of 75 ohms or 120 ohms with 120/75 ohms adapter (Balun).

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross conection of input lines to physical input ports.

Using TL1

The TL1 command to edit the termination is the following:

Input Syntax

```
ED-EQPT-IL::aid:ctag::TERMINATION=termination;
```

Example:

```
ED-EQPT-IL::1-1:MYCTAG::TERMINATION=BRIDGED;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
TERMINATION	TERMINATED, BRIDGED	TERMINATED	Input hardware connection type

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → Inputs → *Input 1…4* → *Details* → *Termination*

6.5.4.4 E1 Code Configuration

Two different E1 code types can be fed to the 5548C SSU, such as the following:

AMI: Alternate Mark Inversion

AMI is an encoding technique made by a synchronized clock and using bipolar pulses (transmission of positive and negative pulses) to represent a logic state 1. A logic state 0 is not represented by any symbol and a logic state 1 by alternated pulses.

Example of AMI encoding:
Bits format
`"1 0 0 0 0 1 1 0"`
is encoded as
`"+ 0 0 0 0 - +"`

HDB3: High Density Bipolar Order 3

HDB3 is bipolar signal based on the AMI encoding with a violation code insertion each time there is more than 3 logic states 0

Data transmitted	**Encoded by HDB3**
0	0
1	Alternate Mark Inversion (AMI)
0000	000V (three 0 and a violation)
0000 0000	B00V B00V

Examples of HDB3 encoding

Example 1:
Binary codes combination
`"1 0 0 0 0 1 1 0"`
is encoded by HDB3 in
`"+ 0 0 0 V - + 0"`

Exemple 2:
Binary codes combination
`"1 0 1 0 0 0 0 0 1 1 0 0 0 0 1 1 0 0 0 0 0 0"`
is encoded in HDB3 in
`"+ 0 - 0 0 0 V 0 + - B 0 0 V - + B 0 0 V 0 0"`

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross conection of input lines to physical input ports.

**U
sing TL1**

Input Syntax

```
ED-EQPT-IL::aid:ctag::[CODE=code];
```

Example :

```
ED-EQPT-IL::1-3:MYCTAG::CODE=HDB3;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
CODE	HDB3, AMI	HDB3	Code type of the E1 signal

Using SynManager

Open the *Physical* or *Logical View* → *Elements* → *Input 1…4* → *Code*

6.5.4.5 Configuration of OOF, CRC-4, BPV, CV Alarm Detection

The 5548C has the capability to detect different alarms related to E1 signal. There is also the capability to set customized threshold for alarm detection.
The following thresholds can be selected for each type of alarm detection:
10E-04, **10E-03** and **10E-02**.

The alarms are:

- **Out Of Frame (OOF)**
  - When SSM is enabled and frame type is PCM31
  - When 3 consecutive incorrect FAS words (ITU-T G.706)
  - If Threshold alarm is enabled, additionally to the above criteria, when false words rate of the total number (4000) during 1s, is higher or equal than the Threshold selected
- **CRC-4 alarm**
  - When at least 915 CRC-4 values are false on a total of 1000 (ITU-T G.706)
  - If Threshold alarm is enabled, additionally to the above criteria, when false CRC-4 values rate of the total number (1000) during 1s, is higher or equal than the Threshold selected
- **BiPolar Violation (BPV)** when the code is AMI or
  Code Violation (CV) when the code is HDB3
  - 1 or more BPV or CV detected during an interval of 1s
  - If Threshold alarm is enabled, additionally to the above criterias, when BPV or CV rate of the total number (2.048E+06) during 1s, is higher or equal than the Threshold selected.

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross connection of input lines to physical input ports.

Using TL1

The following command is required to retrieve the current configuration.

Input Syntax

```
RTRV-EQPT-IL:aid:ctag;
```

Example:

```
RTRV-EQPT-IL:1-1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

      "aid:opstate,ssm,INPUT=input,ADM_STATE=adm_state,TERM=te
      rm,CODE=code,WTR=wtr,FRCD=frcd,OOF_DETECT=oof_detect,
      CRC4_DETECT=crc4_detect,BPV_DETECT=bpv_detect,SA4=sa4,
      SA5=sa5,SA6=sa6,SA7=sa7,SA8=sa8,FREQ=freq,TAG=tag"
 ;
```

To edit the alarm detection configuration in one single line, the following command is required.

Input Syntax

```
ED-EQPT-IL::aid:ctag::OOF_DETECT=oof_detect,
CRC4_DETECT=crc4_detect,BPV_DETECT=bpv_detect;
```

Example:

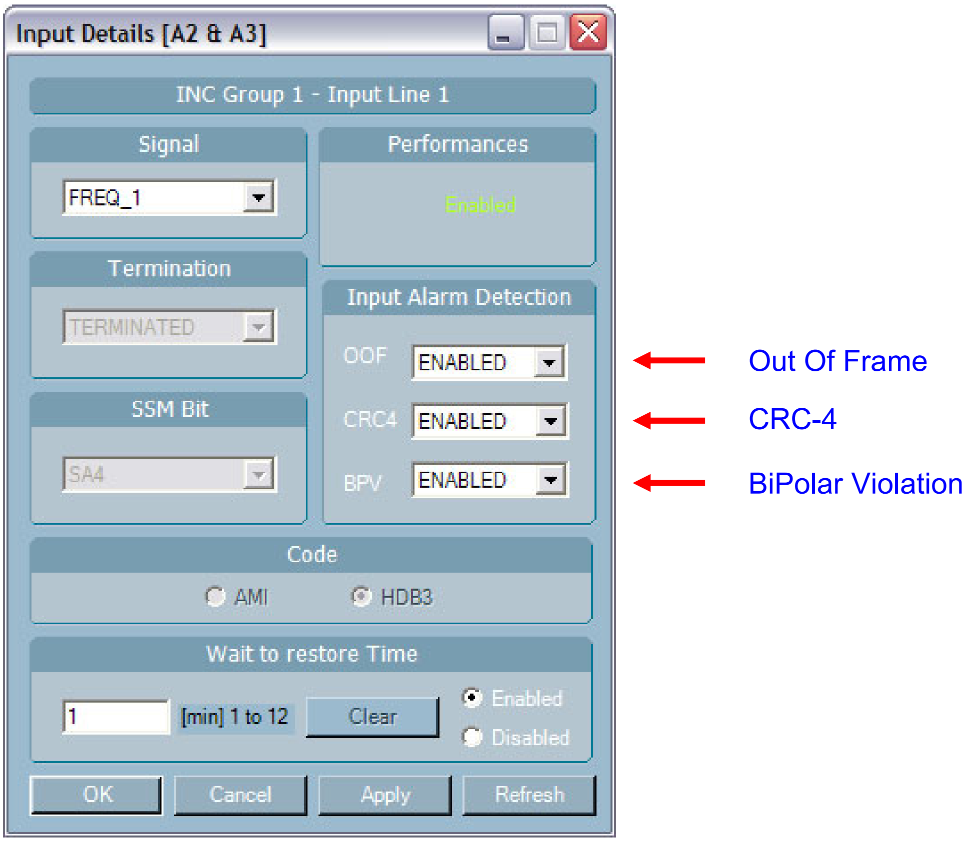
```
ED-EQPT-IL::1-2:MYCTAG::OOF_DETECT=ENABLED,
CRC4_DETECT=10-2,BPV_DETECT=DISABLED;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4, ALL*		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
OOF_DETECT	DISABLED, ENABLED, 10-4, 10-3, 10-2	ENABLED	Determine whether an Out Of Frame alarm should be detected and generated or not. 10-4, 10-3 or 10-2 means that the alarms are enabled with a specific threshold (i.e. 10E-4, 10E-3 or 10E-2). In that case, an alarm is produced when false words rate of the total number (4000) during 1s, is higher or equal than the selected Threshold.
CRC4_DETECT	DISABLED, ENABLED, 10-4, 10-3, 10-2	DISABLED	Determine whether a CRC-4 alarm should be detected and generated or not. 10-4, 10-3 & 10-2 enables the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2) In that case, an alarm is produced when false CRC-4 values rate of the total number (1000) during 1s, is higher or equal than the Threshold selected
BPV_DETECT	DISABLED, ENABLED, 10-4, 10-3, 10-2	DISABLED	Determine whether a Bipolar Violation (BPV) alarm when using AMI code or Code Violation alarm when using HDB3 code should be detected and generated or not. 10-4, 10-3 & 10-2 enables the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2). In that case, an alarm is produced when BPV or CV rate of the total number (2.048E+06) during 1s, is higher or equal than the Threshold selected

***** Not configurable with software

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *Input 1…4* → *Details* → *Input Alarm Detection*



Alarm Type	Configuration	Description
Out Of Frame	• DISABLED • ENABLED • 10-4 • 10-3 • 10-2	Determine whether an Out Of Frame alarm should be detected and generated or not. 10-4, 10-3 or 10-2 means that the alarms are enabled with a specific threshold (i.e. 10E-4, 10E-3 or 10E-2). In that case, an alarm is produced when false words rate of the total number (4000) during 1s, is higher or equal than the selected Threshold.
CRC-4		Determine whether a CRC-4 alarm should be detected and generated or not. 10-4, 10-3 & 10-2 enables the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2) In that case, an alarm is produced when false CRC-4 values rate of the total number (1000) during 1s, is higher or equal than the selected Threshold

BPV		Determine whether a Bipolar Violation (BPV) alarm when using AMI code or Code Violation alarm when using HDB3 code should be detected and generated or not. 10-4, 10-3 & 10-2 enables the alarm detection threshold (i.e. 10E-4, 10E-3 or 10E-2). In that case, an alarm is produced when BPV or CV rate of the total number (2.048E+06) during 1s, is higher or equal than the selected Threshold

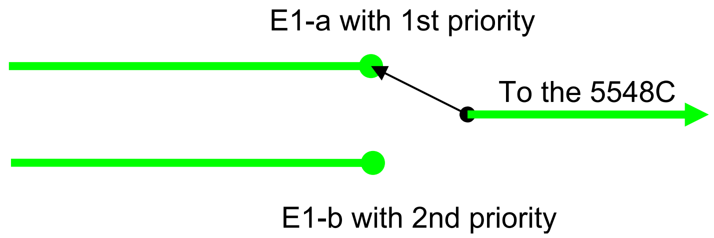
6.5.4.6 Wait-To-Restore Time (WTR)

WTR time is an interval of delay in the acceptance of an input once it has been restored

This function is useful to avoid intermittent hysterysis switching affecting the 5548C clock stability.

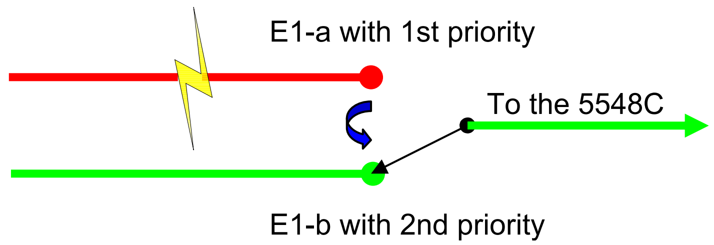
WTR interval is selectable from Disabled to 12 minutes.

The following is an example with two input lines, E1-a and E1-b set with a WTR time. The E1-a line is set with the highest priority:



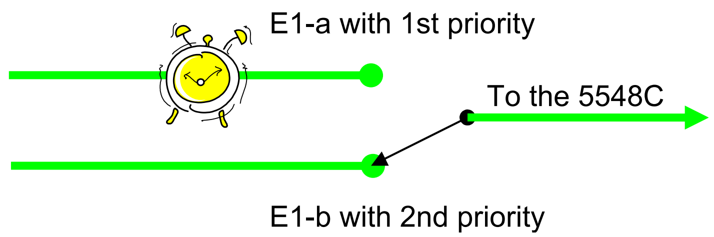
1. Steady state

Both **E1-a** & **-b** are currently working correctly. The **E1-a** is selected by the 5548C as it has the highest priority.



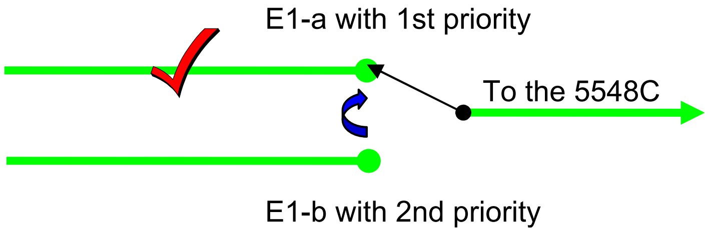
2. Sudden line failure

Suddenly the **E1-a** line is broken for an unknown reason.
The 5548C has selected the **E1-b** line in consequence.



3. Wait-To-Restore time

After a while, the **E1-a** line has been recovered.
But the 5548C waits for the WTR time to elapse before re-establishing the line.



4. Line restoring

Once the WTR time has elapsed, the 5548C reselects the **E1-a** line as 1^{st} priority.

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross connection of input lines to physical input ports.

**U
sing TL1**

Input Syntax

```
ED-EQPT-IL::aid:ctag::WTR=wtr;
```

Example:

```
ED-EQPT-IL::1-1:MYCTAG::WTR=10;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
WTR	DISABLED, 1…12	1	This is the delay in minute before that the 5548C is allowed to select a recovered input line

When a line is in Wait-to-restore time, it is possible to manually clear the remaining time using the following command:

Input Syntax

`INIT-WTR::aid:ctag;`

Example:

`INIT-WTR::IL-1-1:MYCTAG;`

Parameter name	Possible configurations	Default parameters	Description
AID	IL-1-1…IL-1-4, GPS		This parameter is the line to be configured to clear the remaining WTR time

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Input 1…4* → *Details* → *Wait to restore Time*

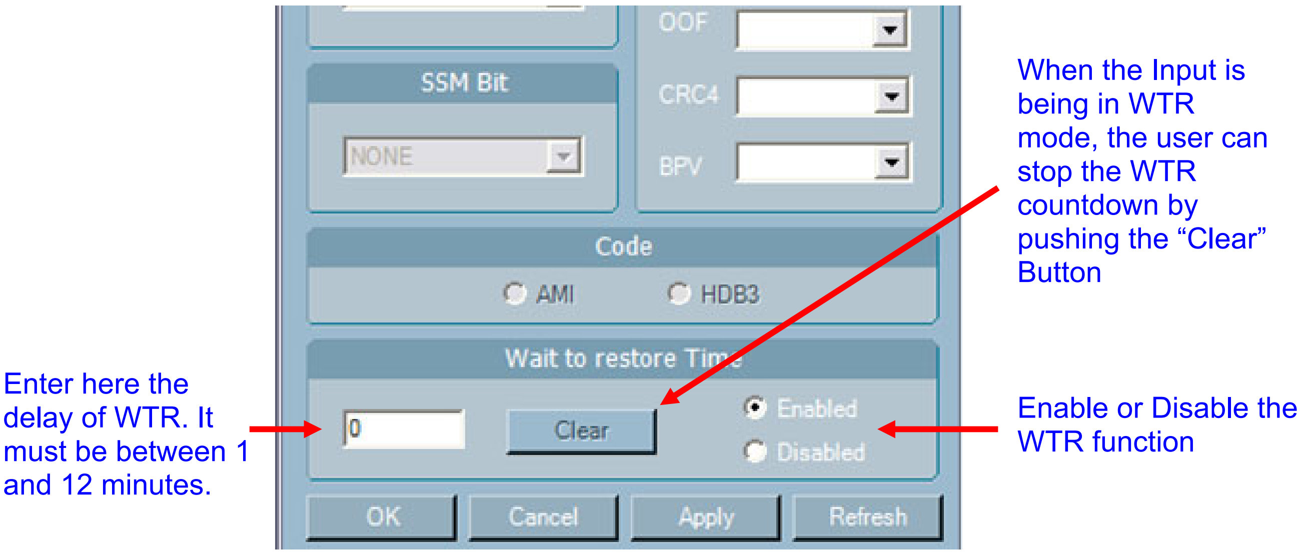


Figure 6-15: SyncView - WTR time

6.6 GPS Configuration

6.6.1 Introduction

Up to two GPS cards can be inserted in the OSA 5548C to get an additional PRS quality input line when GPS cards are locked on GPS signal.

The 5548C allows various properties on GPS input:

- **GPS Card State**
  To retrieve the GPS cards operation status.
- **GPS Input Properties**
  To retrieve the GPS Input properties configuration.
- **GPS Position**
  To retrieve the current GPS position
- **GPS Time**
  To retrieve the GPS time

6.6.2 GPS Card (GPS) Group State

This section explains how to retrieve the state of the GPS group.

Important Note:

The command response refers to the INC group status and not to individual GPS card status.

Input Syntax

```
RTRV-EQPT-GPSC:::ctag;
```

Example:

```
RTRV-EQPT-GPSC:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid  date time
M     ctag COMPLD

      "opstate:SSM=ssm,PERF=perf,SYS_MODE=sys_mode"
;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	EMPTY, EXCTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are different INC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from their respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SSM	OFF, ON	OFF	Indicates if the SSM is ON or OFF
PERF	OFF, ON, ALARM	ON	Indicates if the PERFORMANCE MEASUREMENT is activated, deactivated or in alarm
SYS_MODE	MST, EXP, INV	MST	5548C system mode. MST: MASTER shelf; EXP: EXPANSION shelf; INV: Invalid

6.6.3 GPS Input Properties

Various parameters can be configured and shown in the GPS according, such as:

PPS Offset

The user can set the GPS antenna cable propagation delay between GPS antenna and GPS receiver (3.92ns per meter for LMR-400 cable) in order to trig the PPS phase as close as possible to the UTC time. E.g for 60m + 10m of LMR-400 cable, the PPS offset would be: 70 x 3.92= 274 ns. Add 10ns when a GPS in-line amplifier is mounted along the cable.

Note:

The offset must be negative when setting the PPS delay from the Antenna (e.g. -274 ns) as it is an anticipation of the GPS receiver clock of the time received on the GPS antenna

Changing the PPS offset affecst the PPS output only. The GPS card indicates an alarm during a few seconds.

Administrative State

Like the Input Lines, the GPS input lines can be:

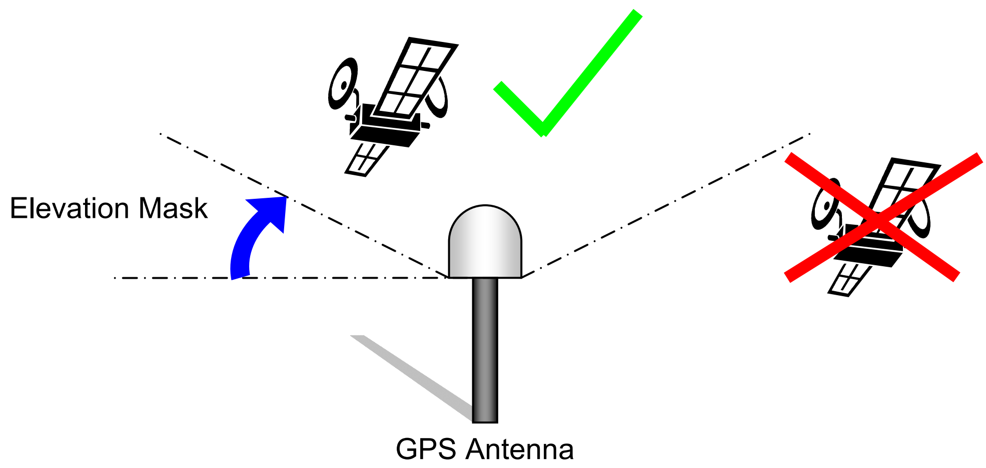
- **Enabled** to activate the selection and qualify the line,
- **Monitored** to allow the performance measurement of the line but ignoring it within the Input selection
- **Disabled** to deactivate the line.

Indoor

In “Urban Canyon” locations, the GPS can be set as Indoor mode to operate with only one GPS satellite tracked. The user must set manually the GPS position (latitude, longitude and altitude) when using the Indoor mode.

Elevation

To avoid receiving bad GPS signal from reflection an **elevation mask** can be set to decrease the reception angle of the antenna.



Forced

The GPS card can generate a user-defined SSM quality for input selection in SSM mode. When the Forced mode is not enabled, the SSM quality supplied are the following:

- PRC when the GPS signal is tracked
- DNU when the GPS signal is not tracked

Visible

Number of Satellites Vehicles available from the GPS antenna location.

Tracked

Number of Satellites vehicles currently tracked by the GPS receiver, at least 4 must be tracked to determine the GPS antenna position and one if the position is entered in Indoor mode. The GPS receiver can track up to 12 Satellites vehicles at the same time.

Note:

The properties are those of the active GPS card

Using TL1

To retrieve the current GPS Properties, send the following command.

Input Syntax

```
RTRV-EQPT-GPS:::ctag;
```

Example:

```
RTRV-EQPT-GPS:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "opstate,ssm:PPS_OFFSET=pps_offset,ADM_STATE=adm_state,
 INDOOR=indoor,ELEVATION=elevation,
 FRCD=frcd,VISIBLE=visible,TRACKED=tracked"
 ;
```

To edit all the parameters, send the following command.

Input Syntax

```
ED-EQPT-GPS:::ctag::[PPS_OFFSET=pps_offset],
[ADM_STATE=adm_state],[INDOOR=indoor],
[ELEVATION=elevation],[FRCD=frcd];
```

Example:

```
ED-EQPT-GPS:::MYCTAG::PPS_OFFSET=274,ADM_STATE=ENABLED,
INDOOR=OFF,ELEVATION=15,FRCD=NONE;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	OK, ALARM, PERFALARM	Depends on state.	GPS Operation state: OK: The system works correctly ALARM: GPS reception in alarm PRFALARM: Performance crosses the quality threshold
SSM	PRC, SSU_A, SSU_B, SEC, DNU, NONE, DISABLED	PRC when locked; DNU when unlocked	SSM quality supplied by the GPS group.
PPS_OFFSET	-999'999..999'999	0	PPS offset
ADM_STATE	ENABLED, MONITORED, DISABLED	ENABLED	Administrative state of the line: ENABLED: the line can be selected; MONITORED: the line is measured but ignored for selection; DISABLED:The line is deactivated

Parameter name	Possible configurations	Default parameters	Description
INDOOR	ON, OFF	OFF	Enable the GPS to track only one satellite instead of four. In that case a fixed position must be programmed.
ELEVATION	5 to 90	10	Elevation mask in degrees. Satellites below this mask are not taken into account.
FRCD	PRC, SSU_A, SSU_B, SEC, DNU, NONE	NONE	Forced SSM quality
VISIBLE	0…12	0	Number of available satellites
TRACKED	0…12	0	Number of tracked satellites

6.6.3.1 PPS Offser and Elevation Mask Setting

Using TL1

Input Syntax

```
ED-EQPT-GPS:::ctag::[PPS_OFFSET=pps_offset],
[ELEVATION=elevation];
```

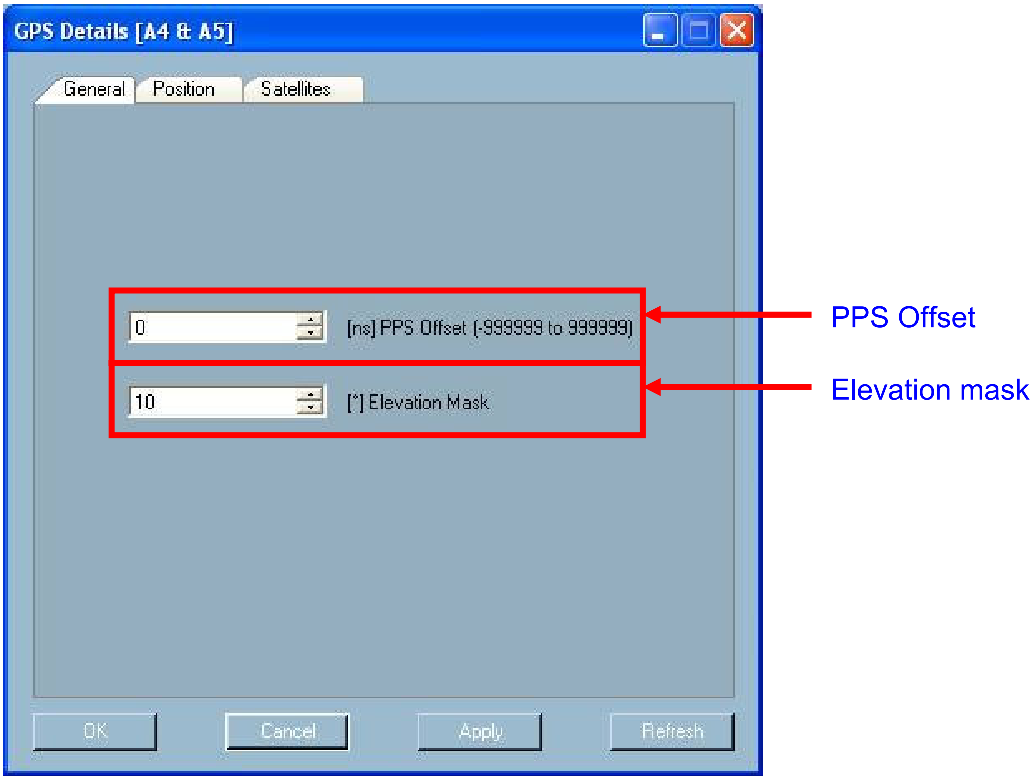
Example:

```
ED-EQPT-GPS:::MYCTAG::PPS_OFFSET=274,ELEVATION=15;
```

Parameter name	Possible configurations	Default parameters	Description
PPS_OFFSET	-999'999..999'999	0	PPS offset
ELEVATION	5 to 90	10	Elevation mask in degrees. Satellites below this mask are not taken into account.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *General* tab



6.6.3.2 Indoor Mode

Using TL1

To enable or disable the Indoor mode, send the following command.

Input Syntax

```
ED-EQPT-GPS:::ctag::[INDOOR=indoor];
```

Example:

```
ED-EQPT-GPS:::MYCTAG::INDOOR=ON;
```

To retrieve the position set, send the following command.

Input Syntax

```
RTRV-EQPT-FPOS:::ctag;
```

Example:

```
RTRV-EQPT-FPOS:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "lat,deg,min,frac_min:long,deg,min,frac_min:alt"
 ;
```

To edit the position, send the following command.

Input Syntax

```
ED-EQPT-FPOS:::ctag::lat,deg,min,frac_min:
long,deg,min,frac_min:alt;
```

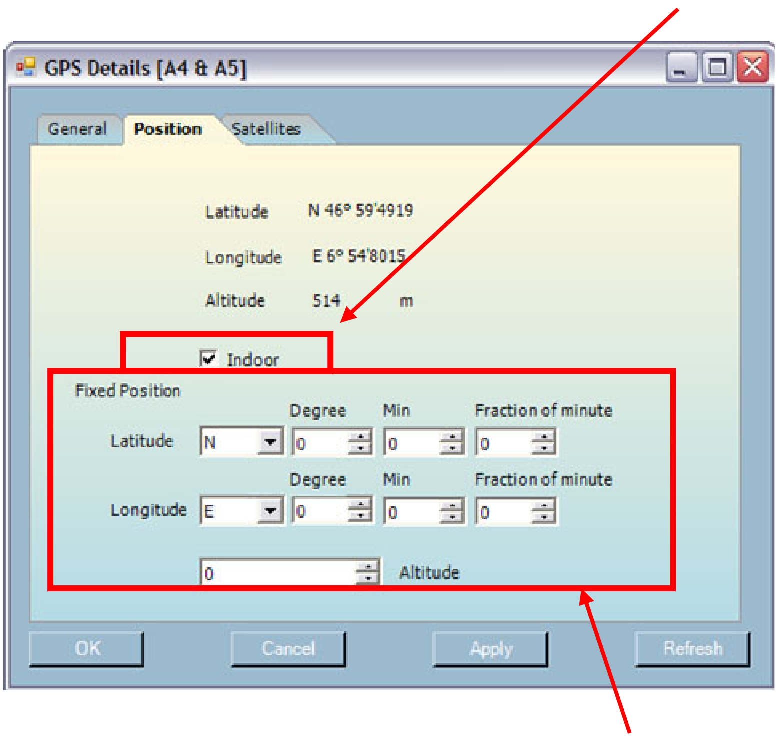
Example:

```
ED-EQPT-FPOS:::ctag::lat,deg,min,frac_min:
long,deg,min,frac_min:alt;
```

Parameter name	Possible configurations	Default parameters	Description
INDOOR	ON, OFF	OFF	Enable the GPS to track only one satellite instead of four. In that case a fixed position must be programmed.
LAT	N, S	N	Latitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
LONG	E, W	E	Longitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
ALT	999..18'000	0	Altitude in meters

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *Position* tab



6.6.3.3 Retrieving Visible and Tracked Satellites

Using TL1

To retrieve the number of available (visible) and tracked satellites, send the following command.

<u>Input Syntax</u>

```
RTRV-EQPT-GPS:::ctag;
```

Example:

```
RTRV-EQPT-GPS:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "opstate,ssm: PPS_OFFSET=pps_offset,ADM_STATE=adm_state,
 INDOOR=indoor,ELEVATION=elevation,
 FRCD=frcd,VISIBLE=visible,TRACKED=tracked"
 ;
```

To retrieve the list of **Visible satellites**, send the following command.

Input Syntax

```
RTRV-EQPT-VSAT::aid:ctag;
```

Example:

```
RTRV-EQPT-VSAT::1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "aid:SAT_ID=sat_id,ELEVATION=elevation,BEARING=bearing,
 SNR=snr,HEALTH=health"
 ;
```

To retrieve the list of **Tracked satellites**, send the following command.

Input Syntax

```
RTRV-EQPT-TSAT::aid:ctag;
```

Example:

```
RTRV-EQPT-TSAT::1:MYCTAG;
```

The response is formatted as below.

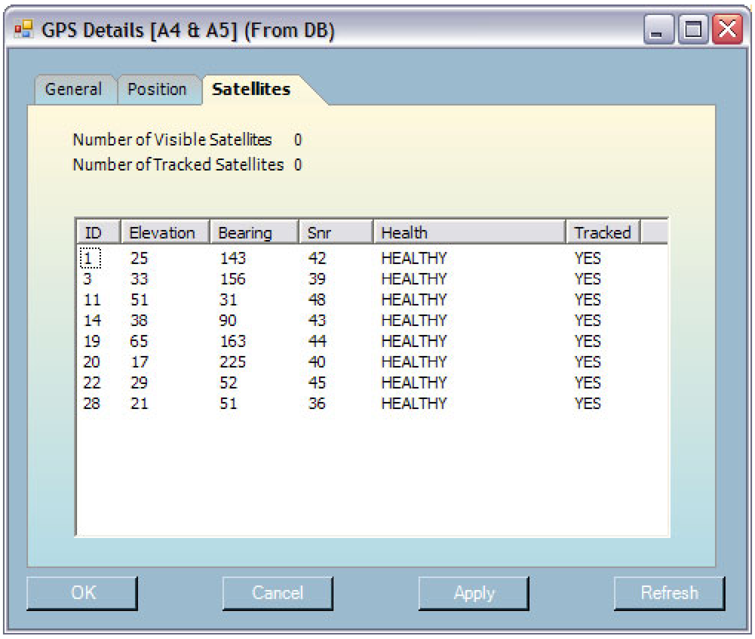
Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

"aid:SAT_ID=sat_id"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
VISIBLE	0…12	0	Number of available satellites
TRACKED	0…12	0	Number of tracked satellites
AID	1..12, ALL		Specify the Satellite number
SAT_ID	1…32		Identification number of satellite
ELEVATION	5…90		Elevation angle of the satellite in degrees
BEARING	0…359		Polar Coordinate in degrees
SNR	0…99		Signal noise ratio in dBHz. Only available on tracked satellites.
HEALTH	NO_ALMANAC, UNHEALTHY, HEALTHY		Satellite's health. Satellite must be healthy to be tracked.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *Satellites* tab



Parameter name	Possible configurations	Description
ID	1…32	Identification number of satellite
ELEVATION	5…90	Elevation angle of the satellite in degrees
BEARING	0…359	Polar Coordinate in degrees
SNR	0…99	Signal noise ratio in dBHz. Only available on tracked satellites.
HEALTH	NO_ALMANAC, UNHEALTHY, HEALTHY	Satellite's health. Satellite must be healthy to be tracked.
TRACKED	YES, NO	Whether satellite is tracked or not

6.6.4 Retrieving GPS Position

Once the GPS card has tracked 4 satellites, or 1 in Indoor mode, it can show the antenna position.

Using TL1

Input Syntax

```
RTRV-EQPT-POS:::ctag;
```

Example:

```
RTRV-EQPT-POS:::MYCTAG;
```

The response is formatted as below.

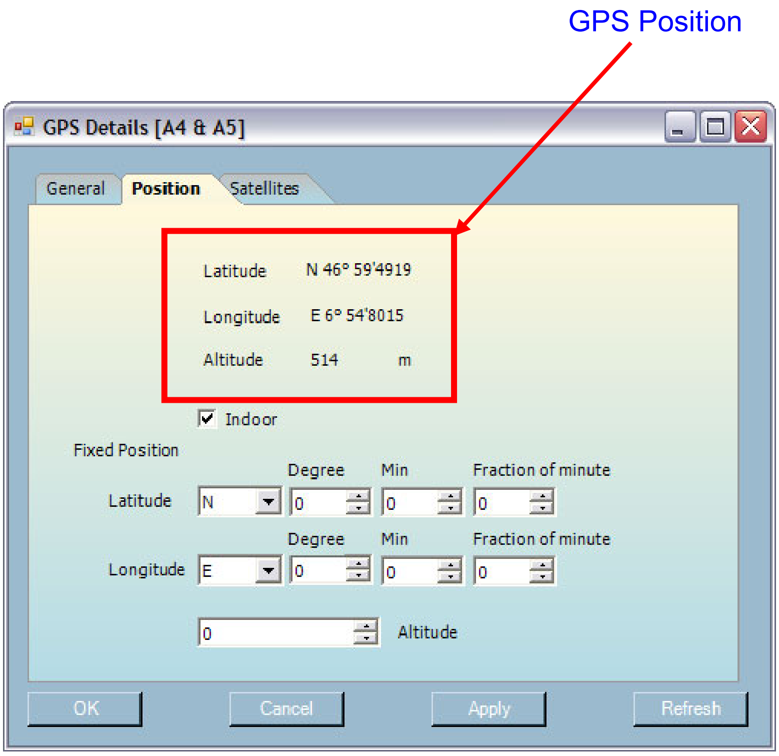
Output Syntax

```
      sid   date  time
M     ctag  COMPLD

"lat,deg,min,frac_min:long,deg,min,frac_min:alt"
;
```

Parameter name	Possible configurations	Default parameters	Description
LAT	N, S	N	Latitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
LONG	E, W	E	Longitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
ALT	999..18'000	0	Altitude in meters

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *Position* tab



6.6.5 GPS Time

To retrieve the GPS time, send the following command

Input Syntax

```
RTRV-EQPT-GPSTIME:::ctag;
```

Example:

```
RTRV-EQPT-GPSTIME:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
M     ctag  COMPLD

"WEEK=week,SEC=sec"
;
```

Parameter name	Possible configurations	Default parameters	Description
WEEK	0…3182		Week number since 6. January 1980
SEC	0…604799		Degrees

6.7 GNSS Configuration

6.7.1 Introduction

Up to two GNSS cards can be inserted in the OSA 5548C to get an additional PRS quality input line when GNSS cards are locked on GNSS signal.

The 5548C allows various properties on GNSS input:

- **GNSS Card State**
  To retrieve the GNSS cards operation status.
- **GNSS Input Properties**
  To retrieve the GNSS Input properties configuration.
- **GNSS Position**
  To retrieve the current GNSS position
- **GNSS Time**
  To retrieve the GNSS time

6.7.2 GNSS Card (GNSS) Group State

This section explains how to retrieve the state of the GNSS group.

Important Note:

The command response refers to the INC group status and not to individual GNSS card status.

Input Syntax

```
RTRV-EQPT-GPSC:::ctag;
```

Example:

```
RTRV-EQPT-GPSC:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

       "opstate:SSM=ssm,PERF=perf,SYS_MODE=sys_mode"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	EMPTY, EXCTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are different INC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from their respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SSM	OFF, ON	OFF	Indicates if the SSM is ON or OFF
PERF	OFF, ON, ALARM	ON	Indicates if the PERFORMANCE MEASUREMENT is activated, deactivated or in alarm
SYS_MODE	MST, EXP, INV	MST	5548C system mode. MST: MASTER shelf; EXP: EXPANSION shelf; INV: Invalid

6.7.3 GNSS Input Properties

Various parameters can be configured and shown in the GNSS according, such as:

PPS Offset
The user can set the GNSS antenna cable propagation delay between GNSS antenna and GNSS receiver (3.92ns per meter for LMR-400 cable) in order to trig the PPS phase as close as possible to the UTC time. E.g for 60m + 10m of LMR-400 cable, the PPS offset would be: 70 x 3.92= 274 ns. Add 10ns when a GNSS in-line amplifier is mounted along the cable.

Note:

The offset must be negative when setting the PPS delay from the Antenna (e.g. -274 ns) as it is an anticipation of the GNSS receiver clock of the time received on the GNSS antenna

Changing the PPS offset affecst the PPS output only. The GNSS card indicates an alarm during a few seconds.

Administrative State
Like the Input Lines, the GNSS input lines can be:

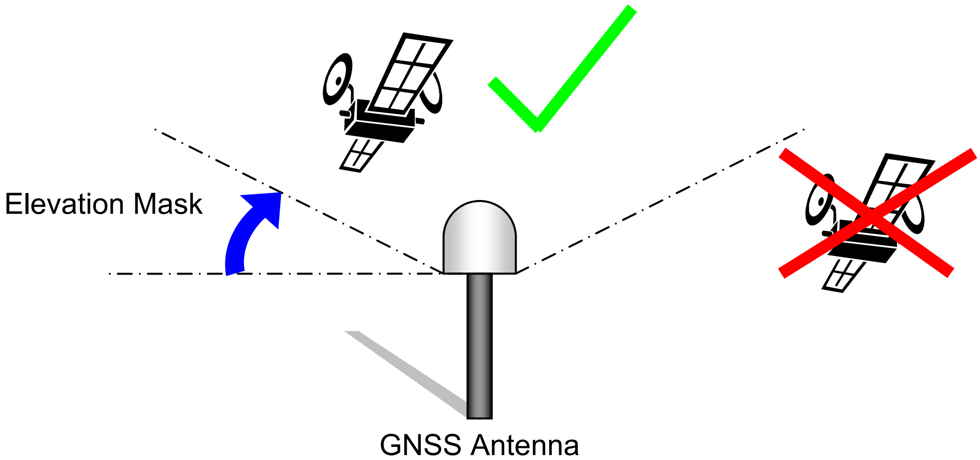
- **Enabled** to activate the selection and qualify the line,
- **Monitored** to allow the performance measurement of the line but ignoring it within the Input selection
- **Disabled** to deactivate the line.

Indoor

In “Urban Canyon” locations, the GNSS can be set as Indoor mode to operate with only one GNSS satellite tracked. The user must set manually the GNSS position (latitude, longitude and altitude) when using the Indoor mode.

Elevation

To avoid receiving bad GNSS signal from reflection an **elevation mask** can be set to decrease the reception angle of the antenna.



Forced

The GNSS card can generate a user-defined SSM quality for input selection in SSM mode. When the Forced mode is not enabled, the SSM quality supplied are the following:

- PRC when the GNSS signal is tracked
- DNU when the GNSS signal is not tracked

Visible

Number of Satellites Vehicles available from the GNSS antenna location.

Tracked

Number of Satellites vehicles currently tracked by the GNSS receiver, at least 4 must be tracked to determine the GNSS antenna position and one if the position is entered in Indoor mode. The GNSS receiver can track up to 12 Satellites vehicles at the same time.

Note:

The properties are those of the active GNSS card

Using TL1

To retrieve the current GNSS Properties, send the following command.

Input Syntax

```
RTRV-EQPT-GNSS:::ctag;
```

Example:

```
RTRV-EQPT-GNSS:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
     sid  date time
M    ctag COMPLD

"opstate,ssm:PPS_OFFSET=pps_offset,ADM_STATE=adm_state,
INDOOR=indoor,ELEVATION=elevation,
FRCD=frcd,VISIBLE=visible,TRACKED=tracked"
;
```

To edit all the parameters, send the following command.

Input Syntax

```
ED-EQPT-GNSS:::ctag::GLN-A/GLN-
B:CTAG:[PPS_OFFSET=pps_offset],[INDOOR=indoor],
[ELEVATION=elevation],[ANTENA_STATE=enable/disable],[GNSS_MODE=
GPS¦&GLONASS¦&SBAS];;
```

Example:

```
ED-EQPT-GNSS::GLN-A:MYCTAG::PPS_OFFSET=274,
INDOOR=OFF,ELEVATION=15,ANTENA_STATE=ENABLE,
GNSS_MODE=GPS&GLONASS;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	OK, ALARM, PERFALARM	Depends on state.	GPS Operation state: OK: The system works correctly ALARM: GPS reception in alarm PRFALARM: Performance crosses the quality threshold
SSM	PRC, SSU_A, SSU_B, SEC, DNU, NONE, DISABLED	PRC when locked; DNU when unlocked	SSM quality supplied by the GPS group.
PPS_OFFSET	-999'999..999'999	0	PPS offset

ADM_STATE	ENABLED, MONITORED, DISABLED	ENABLED	Administrative state of the line: ENABLED: the line can be selected; MONITORED: the line is measured but ignored for selection; DISABLED:The line is deactivated
INDOOR	ON, OFF	OFF	Enable the GPS to track only one satellite instead of four. In that case a fixed position must be programmed.
ELEVATION	5 to 90	10	Elevation mask in degrees. Satellites below this mask are not taken into account.
FRCD	PRC, SSU_A, SSU_B, SEC, DNU, NONE	NONE	Forced SSM quality
VISIBLE	0…32	0	Number of available satellites
TRACKED	0…24	0	Number of tracked satellites

6.7.3.1 PPS Offset and Elevation Mask Setting

Using TL1

<u>Input Syntax</u>

```
ED-EQPT-GNSS::GLN-A:ctag::[PPS_OFFSET=pps_offset],
[ELEVATION=elevation];
```

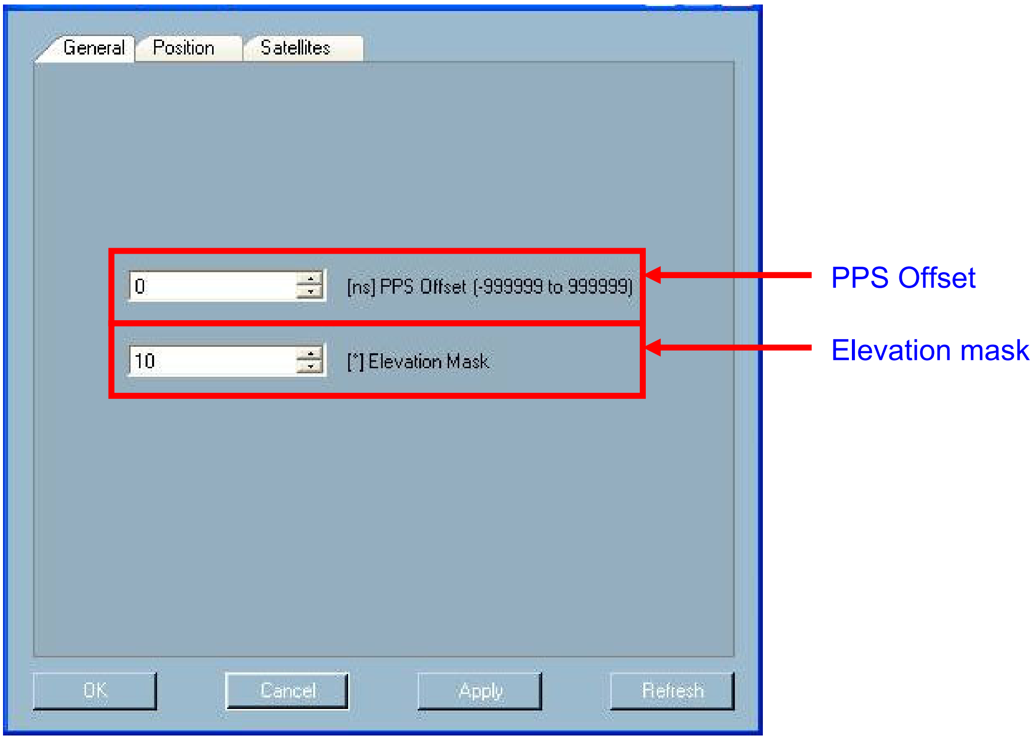
Example:

```
ED-EQPT-GPS::GLN-A:MYCTAG::PPS_OFFSET=274,ELEVATION=15;
```

Parameter name	Possible configurations	Default parameters	Description
PPS_OFFSET	-999'999..999'999	0	PPS offset
ELEVATION	5 to 90	10	Elevation mask in degrees. Satellites below this mask are not taken into account.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *General* tab



6.7.3.2 Indoor Mode

Using TL1

To enable or disable the Indoor mode, send the following command.

Input Syntax

```
ED-EQPT-GNSS::GLN-A:ctag::[INDOOR=indoor];
```

Example:

```
ED-EQPT-GNSS::GLN-A:MYCTAG::INDOOR=ON;
```

To retrieve the position set, send the following command.

Input Syntax

```
RTRV-EQPT-FPOS:::ctag;
```

Example:

```
RTRV-EQPT-FPOS:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
M     ctag  COMPLD

"lat,deg,min,frac_min:long,deg,min,frac_min:alt"
;
```

To edit the position, send the following command.

Input Syntax

```
ED-EQPT-FPOS:::ctag::lat,deg,min,frac_min:
long,deg,min,frac_min:alt;
```

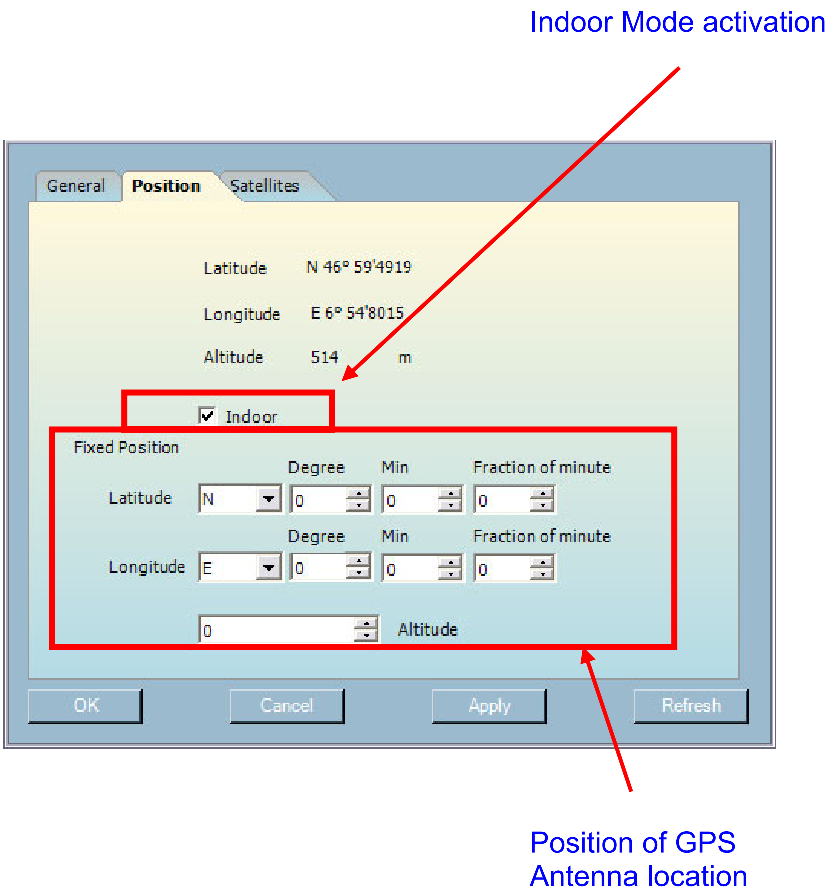
Example:

```
ED-EQPT-FPOS:::ctag::lat,deg,min,frac_min:
long,deg,min,frac_min:alt;
```

Parameter name	Possible configurations	Default parameters	Description
INDOOR	ON, OFF	OFF	Enable the GPS to track only one satellite instead of four. In that case a fixed position must be programmed.
LAT	N, S	N	Latitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
LONG	E, W	E	Longitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
ALT	999..18'000	0	Altitude in meters

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *Position* tab



6.7.3.3 Retrieving Visible and Tracked Satellites

Using TL1

To retrieve the number of available (visible) and tracked satellites, send the following command.

<u>Input Syntax</u>

`RTRV-EQPT-GNSS::GLN-A/GLN-B:ctag;`

Example:

`RTRV-EQPT-GNSS::GLN-A:MYCTAG;`

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "opstate,ssm: PPS_OFFSET=pps_offset,ADM_STATE=adm_state,
 INDOOR=indoor,ELEVATION=elevation,
 FRCD=frcd,VISIBLE=visible,TRACKED=tracked"
 ;
```

To retrieve the list of **Visible satellites**, send the following command.

Input Syntax

```
RTRV-EQPT-GNSS-VSAT::aid:ctag;
```

Example:

```
RTRV-EQPT-GNSS-VSAT::1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "aid:SAT_ID=sat_id,ELEVATION=elevation,BEARING=bearing,
 SNR=snr,HEALTH=health"
 ;
```

To retrieve the list of **Tracked satellites**, send the following command.

Input Syntax

```
RTRV-EQPT-GNSS-TSAT::aid:ctag;
```

Example:

```
RTRV-EQPT-GNSS-TSAT::1:MYCTAG;
```

The response is formatted as below.

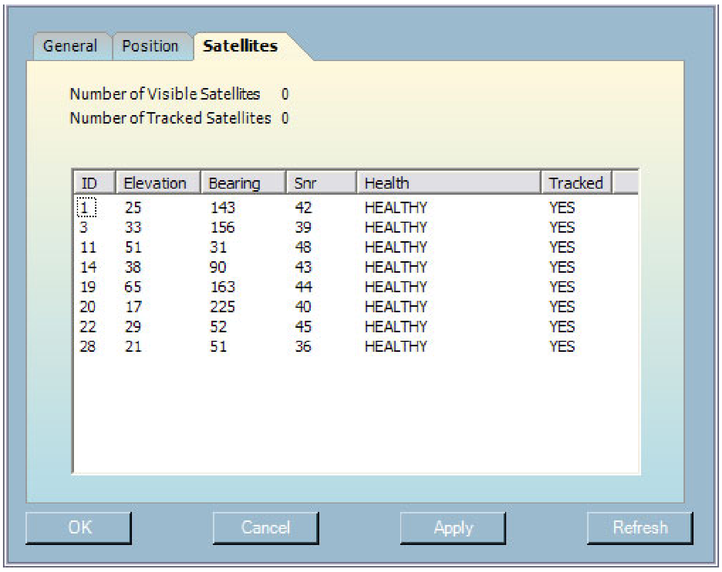
Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

"aid:SAT_ID=sat_id"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
VISIBLE	0…32	0	Number of available satellites
TRACKED	0…24	0	Number of tracked satellites
AID	0..32, ALL		Specify the Satellite number
SAT_ID	1…32 +37…69		Identification number of satellite
ELEVATION	5…90		Elevation angle of the satellite in degrees
BEARING	0…359		Polar Coordinate in degrees
SNR	0…99		Signal noise ratio in dBHz. Only available on tracked satellites.
HEALTH	NO_ALMANAC, UNHEALTHY, HEALTHY		Satellite's health. Satellite must be healthy to be tracked.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *Satellites* tab



Parameter name	Possible configurations	Description
ID	1…32	Identification number of satellite
ELEVATION	5…90	Elevation angle of the satellite in degrees
BEARING	0…359	Polar Coordinate in degrees
SNR	0…99	Signal noise ratio in dBHz. Only available on tracked satellites.
HEALTH	NO_ALMANAC, UNHEALTHY, HEALTHY	Satellite's health. Satellite must be healthy to be tracked.
TRACKED	YES, NO	Whether satellite is tracked or not

6.7.4 Retrieving GNSS Position

Once the GNSS card has tracked 4 satellites, or 1 in Indoor mode, it can show the antenna position.

Using TL1

Input Syntax

```
RTRV-EQPT-POS:::ctag;
```

Example:

```
RTRV-EQPT-POS:::MYCTAG;
```

The response is formatted as below.

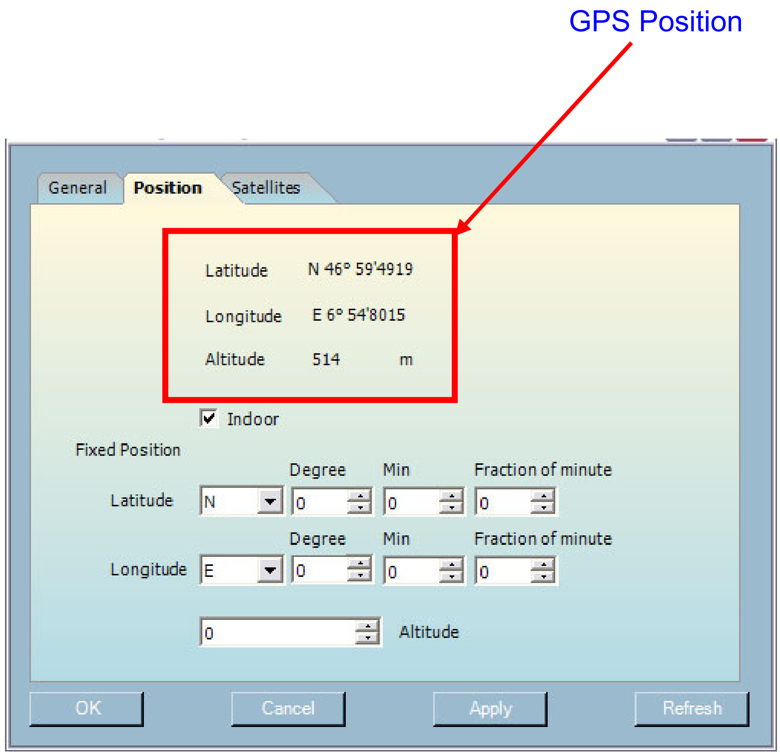
Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "lat,deg,min,frac_min:long,deg,min,frac_min:alt"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
LAT	N, S	N	Latitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
LONG	E, W	E	Longitude
DEG	0…90	0	Degrees
MIN	0…59	0	Minutes
FRAC_MIN	0…9999	0	Fraction of minute
ALT	999..18'000	0	Altitude in meters

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *GPS Input* → *Details* → *Position* tab



6.7.5 GPS Time

To retrieve the GPS time, send the following command

Input Syntax

```
RTRV-EQPT-GPSTIME:::ctag;
```

Example:

```
RTRV-EQPT-GPSTIME:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
M     ctag  COMPLD

"WEEK=week,SEC=sec"
;
```

Parameter name	Possible configurations	Default parameters	Description
WEEK	0…3182		Week number since 6. January 1980
SEC	0…604799		Degrees

6.8 Line Switching, Tracking & Holdover (THC), Signal Filtering and Processing

This section includes information on what and how the 5548C can do with the signal processed by the INCs as per the previous section 6.5 and the SGCs & OUCs in section 6.9 according to the following points:

- THC state
- MADDS state
- The selection mode to configure the input line selection mode (Automatic, Manual, …)
- The input line priorities to program the input selection to the user preferences
- The pass-through mode

6.8.1 THC Group State

Note:

The command response refers to the THC group status and not to individual THC card status.

The THC cards handle the input line switching, signal processing and filtering

For retrieving the current THC status, use the following command:

Input Syntax

```
RTRV-EQPT-THC::ctag;
```

The response is formatted as below. The following description will focus only on the THC configuration. Other parameters concerning the switching are presented in the next sections.

Output Syntax

```
       sid   date  time
M      ctag  COMPLD

"opstate:MAN_INPUT=man_input,MODE=mode,ACT_INPUT=act_input,
SSM=ssm,SYS_MODE=sys_mode"
;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	EMPTY, EXTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are different THC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from their respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SSM	ON, OFF	OFF	SSM state.
SYS_MODE	MST, EXP, INV	MST	5548C system mode. MST: MASTER shelf; EXP: EXPANSION shelf; INV: Invalid

6.8.2 Manual & Automatic Direct Digital Synthesis (MADDS)

The MADDS is an embedded engine in the THC card, which filters the signal received on the THC input.

The MADDS can show different operating modes related to the THC status:

- **TRACKED:** the MADDS and THC are correctly tracking the currently selected input signal.
- **WARMUP:** this state is present while the internal THC oscillator is warming-up (i.e. after shelf power-up or when inserting a new THC).
- **FAST:** this state should last approximately 1 minute. This is shown when the MADDS is changing its bandwidth in order to track the selected signal more rapidly.
- **FREERUN:** This status is shown when the MADDS and the rest of THC have never tracked any input signal since the shelf power-up.
- **HOLDOVER:** This status is shown when the MADDS and the rest of the THCs no longer have any input signals on their inputs, and hence, the internal oscillator provides the shelf synchronization source.

Using TL1

To retrieve the current status, the following command is required:

Input Syntax

```
RTRV-EQPT-MADDS:::ctag;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

"madds_state:[OSACLK=osaclk],OSACLKAVL=osaclkavl,
SYS_MODE=sys_mode"
 ;
```

To set the parameters, the following command should be sent:

Input Syntax

```
ED-EQPT-MADDS:::ctag::[OSACLK=osaclk];
```

Example:

```
ED-EQPT-MADDS:::MYCTAG::OSACLK=OFF;
```

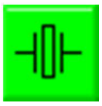
Parameter name	Possible configurations	Default parameters	Description
MADDS_STATE*	TRACKED, WARMUP, FAST, FREERUN, HOLDOVER		This is the state of MADDS (THC) **TRACKED:** the MADDS is correctly tracking the selected input signal. **WARMUP:** this state is present while the internal THC oscillator is warming-up (i.e. after shelf power-up) **FAST:** this state should take approximately 1 minute. This is shown when the MADDS is changing its bandwidth in order to track the selected signal rapidly. **FREERUN:** This status is shown when the THC/MADDS have never tracked any input signal. **HOLDOVER:** This status is shown when the THC/MADDS no longer have any input signals on their inputs
OSACLK[1]	ON, OFF	OFF	OSAClock enable (ON) or disable(OFF)
OSACLKAVL*	YES, NO	NO	YES if the OSAclock is available or NOT if not
SYS_MODE	MST, EXP, INV	MST	5548C system mode. MST: MASTER shelf; EXP: EXPANSION shelf; INV: Invalid

* Not configurable

1) this feature is not yet available

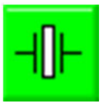
Using SyncView

Open the *Logical View* and check the THC symbol state



TRACKED: the MADDS is correctly tracking the selected input signal.

HOLDOVER or **FREERUN:** this status is shown when the THC/MADDS have any input signals on their inputs



FAST: this state should take approximately 1 minute. This is shown when the MADDS is changing its bandwidth in order to track the selected signal rapidly

ALARM: this state is shown when a failure is detected

6.8.3 Oscillator Type

Using TL1

To retrieve the oscillator type embedded in the THC card, send the following command.

Input Syntax

```
RTRV-EQPT-OSC::aid:ctag;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

" aid:type"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
AID	A, B, ALL		THC card
TYPE	RUBIDIUM, OSC-8663		Oscillator type

6.8.4 Switching Mode

The input selection can be set in different modes, such as Automatic, Manual and it is also possible to force the THC internal Oscillator to operate in Holdover mode.

Automatic Mode (AUTO)
This mode enables the 5548C to select the line according to priority criteria.
Example: If the line with priority 2 fails, the 5548C selects the line with the highest priority, when available and not in alarm.
To configure input priorities, please refer to the next section 6.8.5

The SSM mode is also an automatic method to select an E1 line according to a quality level. To enable this switching mode, please refer to section 6.10.

Manual Mode (MAN)
This condition forces the selection of one defined working input line (with no alarm).
Using this selection, the user must enter the line required to select with the parameter "MAN_INPUT" within the TL1 command.
If the selected input line fails, the system immediately goes in Automatic mode.

Forced Holdover Mode (FHLDVR)
This selection mode forces the 5548C to work in holdover. The system will not select any input lines and the internal oscillator supplies synchronization source to the shelf.

Using TL1

Use the following command to obtain the state of the switching parameters.

Input Syntax

```
RTRV-EQPT-THC::ctag;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
M      ctag  COMPLD

"opstate:MAN_INPUT=man_input,MODE=mode,ACT_INPUT=act_input,
SSM=ssm"
 ;
```

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand cross conection concept of input lines to physical input ports.

For editing the configuration in one single line, the following command is required. For more details on each parameter, refer to the next sections.

Input Syntax

```
ED-EQPT-THC:::ctag::[MODE=mode],[MAN_INPUT=man_input];
```

Example:

```
ED-EQPT-THC:::MYCTAG::MODE=MAN,MAN_INPUT=IL-1-2;
```

Parameter name	Possible configurations	Default parameters	Description
MODE	AUTO, MAN, FHLDVR	AUTO	There are different modes of input selection: AUTO: Automatic selection mode. i.e. when a line has failed, the 5548C will automatically switch to the line presenting the next priority. MAN: Manual selection mode. The user can select a specific input reference with the MAN_INPUT parameter. FHLDVR: Forced Holdover. This mode forces the THC to operate in Holdover mode.

Parameter name	Possible configurations	Default parameters	Description
MAN_INPUT	IL-1-1…IL-1-4, GPS	IL-1-1	When the MAN (Manual) mode is enabled, this variable identifies the specific line to be select.
ACT_INPUT *	IL-1-1…IL-1-4, GPS, NONE	IL-1-1	This is the line currently selected by the 5548C

- Not configurable, only upon command answer

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *THC* → *Details*

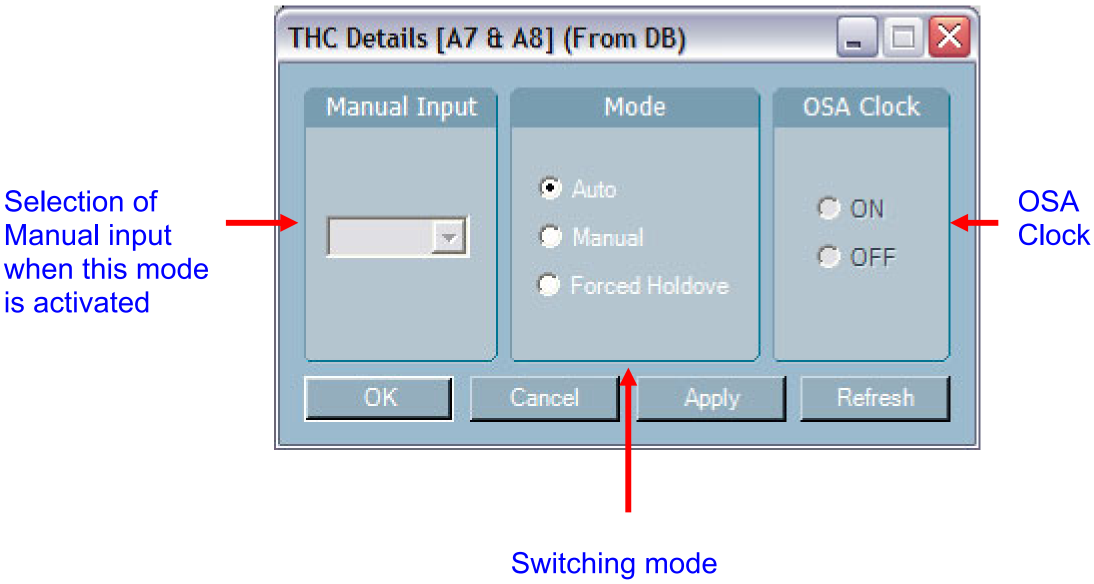


Figure 6-16: SyncView - THC Details

6.8.5 Priorities Configuration

Note:

To retrieve current IL configuration, refer to refer to the **"TL1 Command List"** document.

Read section **Input connector to Input Line (IL) description** to understand the concept of cross connection of input lines to physical input ports.

The OSA 5548C SSU can be fed with up to 5 inputs signal, four from the INC group and 1 from the GPS group, which can be configured with different priorities.

Example: If the IL-1-1 is fed with a signal coming from a Primary Reference Source (PRS) and the IL-1-3 from an E1 leased line, it is possible configure the priority #1 for the IL-1-1 and a lower priority for the IL-1-3.

Note:

The priorities are only taken in consideration when the switching mode is configured as AUTOMATIC and in case of SSM enabled when more than one E1 input lines have the same quality level.

Note:

Two or more input lines can have the same priority according to ITU-T G.781 5.10. When it is the case the switching mode is non-revertive.

Example of Scenario:

1. Two input lines (IL) having the same priority are qualified by the 5548C.
2. One of these two IL is currently selected by the 5548C.
3. This selected IL suddenly fails.
4. The 5548C switches therefore to the second IL.
5. Later the failed IL recovers.
6. The 5548C remains on the current IL selection without switching to the recovered line and thus, does not introduce any instability caused by the input line switching.

Using TL1

For retrieving the current priority configuration, send the following command:

Input Syntax

```
RTRV-PRIO:::ctag;
```

The answer is formatted as below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

 "IL-1-1=il-1-1,IL-1-2=il-1-2,IL-1-3=il-1-3,
 IL-1-4=il-1-4,GPS=gps"
 ;
```

For editing the priorities, send the following command:

Input Syntax

```
ED-PRIO:::ctag::IL-1-1=il-1-1,IL-1-2=il-1-2,IL-1-3=il-1-3,
IL-1-4=il-1-4,GPS=gps;
```

Example :

```
ED-PRIO:::MYCTAG::IL-1-1=1,IL-1-2=3,IL-1-3=2,IL-1-4=4,GPS=5;
```

Parameter name	Possible configurations	Default parameters	Description
IL-1-1	1…5	1	Priority of input 1 of INC group. 1 has the most priority, 5 has the least priority.
IL-1-2	1…5	2	
IL-1-3	1…5	3	
IL-1-4	1…5	4	
GPS	1…5	5	

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *Input 1…4 / GPS* → *Set Priority*

1 has the most priority, 5 has the least priority.

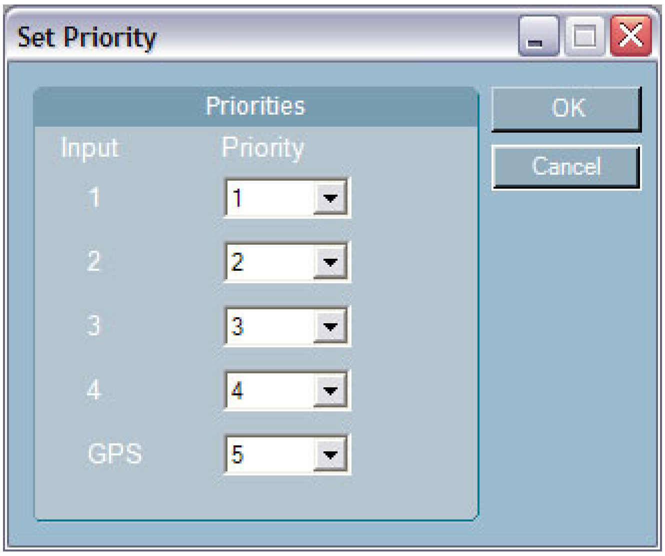
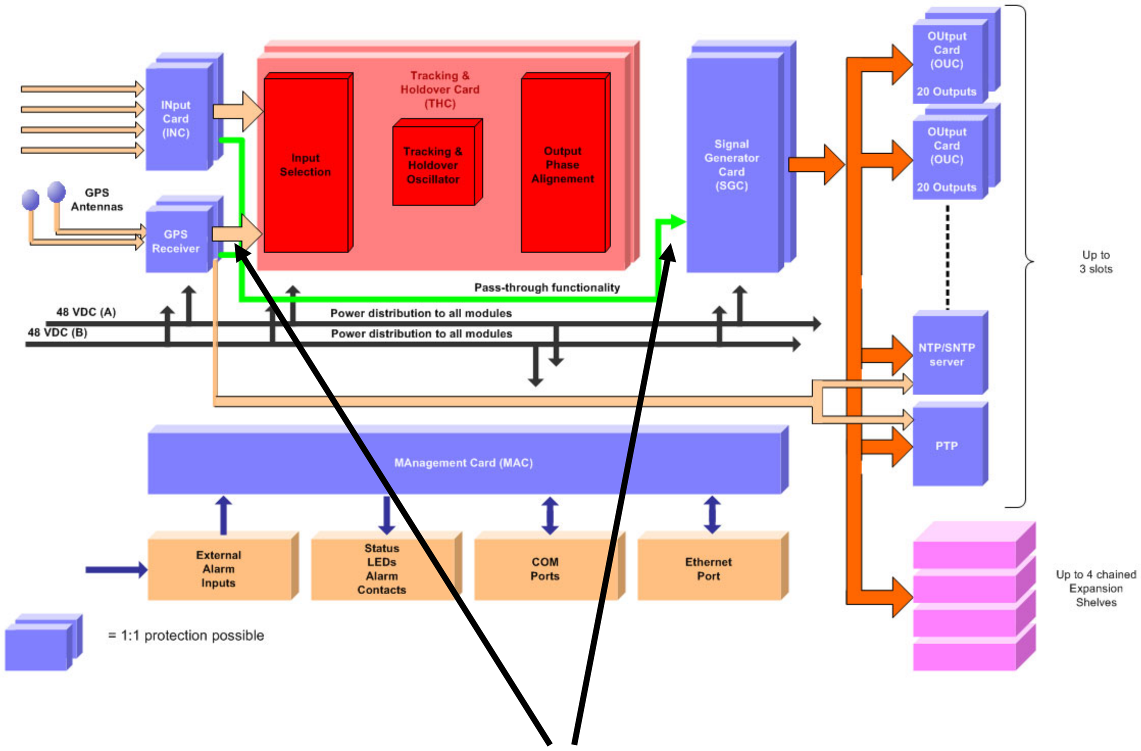


Figure 6-17: SyncView - Priority Setting

6.8.6 Pass-through Mode

The INC GROUP is able to supply a signal in case of either THC removal or failure. This frequency is taken from the first available 2.048MHz or E1 input signal of the GROUP according to the Input Line number, 1 as the highest priority to 4 as the lowest, and then from GPS-A and after GPS-B.



Pass-through signal redirection

Figure 6-18 : Pass-through Mode

Note:

The automatic switching between input lines is possible during Pass-through operation when a line is removed or fails. However, this can introduce phase jumps on output signal.

During the pass-through mode, the SSM code supplied on outputs is the one received by the Input Line (IL). A forced SSM value activated and defined on the IL is ignored during pass-through mode.

Note:

Refer to section 6.5 to retrieve input port and line configuration

In order to retrieve the current pass-through status, the following TL1 command is required.

Input Syntax

```
RTRV-PTHRGH:::ctag;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
M     ctag  COMPLD

      "input,ssm"
;
```

Parameter name	Possible configurations	Default parameters	Description
INPUT	IL-1-1, IL-1-2, IL-1-3, IL-1-4, GPS-A, GPS-B, NONE	IL-1-1	Input line providing the pass-through signal
SSM	PRC, SSU_A, SSU_B, SEC, DNU, FAILED, DISABLED	SEC	SSM quality of the pass-through signal

Note:

During pass-through mode, the f and E1 LEDs of the SGC card(s) flash GREEN.

6.9 Signal Generation & Output Properties

In this section, we explain the parameters to set and how to proceed to obtain correct output frequency type as well as E1 code and frame types according to the user needs.

Here are the points treated in this section:

- Basics on SGC and OUC cards operation to better understand how to proceed with the following points in this section.
- SGC group state and parameters
- OUC group state and parameters
- Output signal type configuration
- Output Line state and output squelch configuration
- Output E1 code & frame configuration

6.9.1 The Basics of SGC & OUC Operation

6.9.1.1 Operation

To obtain clock signal on the output cards after the operation of input signal treatment and filtering, the SGC (Signal Generation Card) cards generate all possible signal types supplied to the OUC (OUtput card) cards, the expansion shelves & PPS outputs as well as 5548C options such as TCC-NTP cards, TCC-PTP cards. This is illustrated in the colored part of the following diagram:

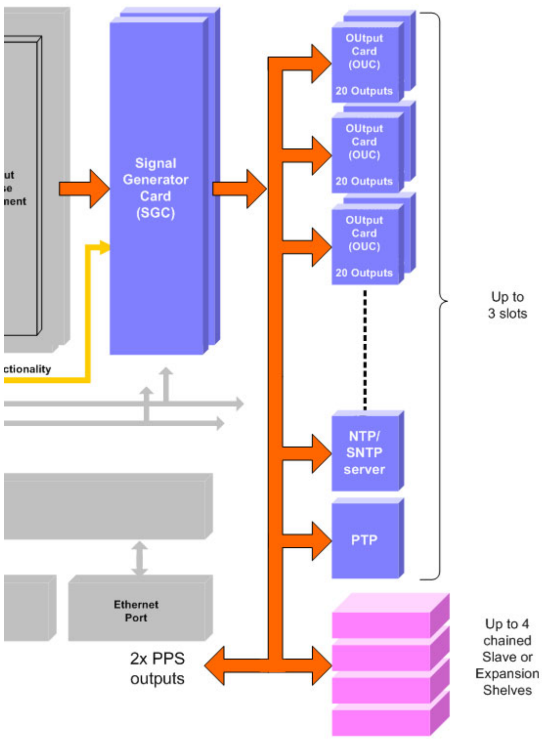


Figure 6-19 : SGC and OUC Operation

6.9.1.2 OUC Cards & Output Tiles Correspondence

On the shelf, the cards and output tile connectors are configured as illustrated below:

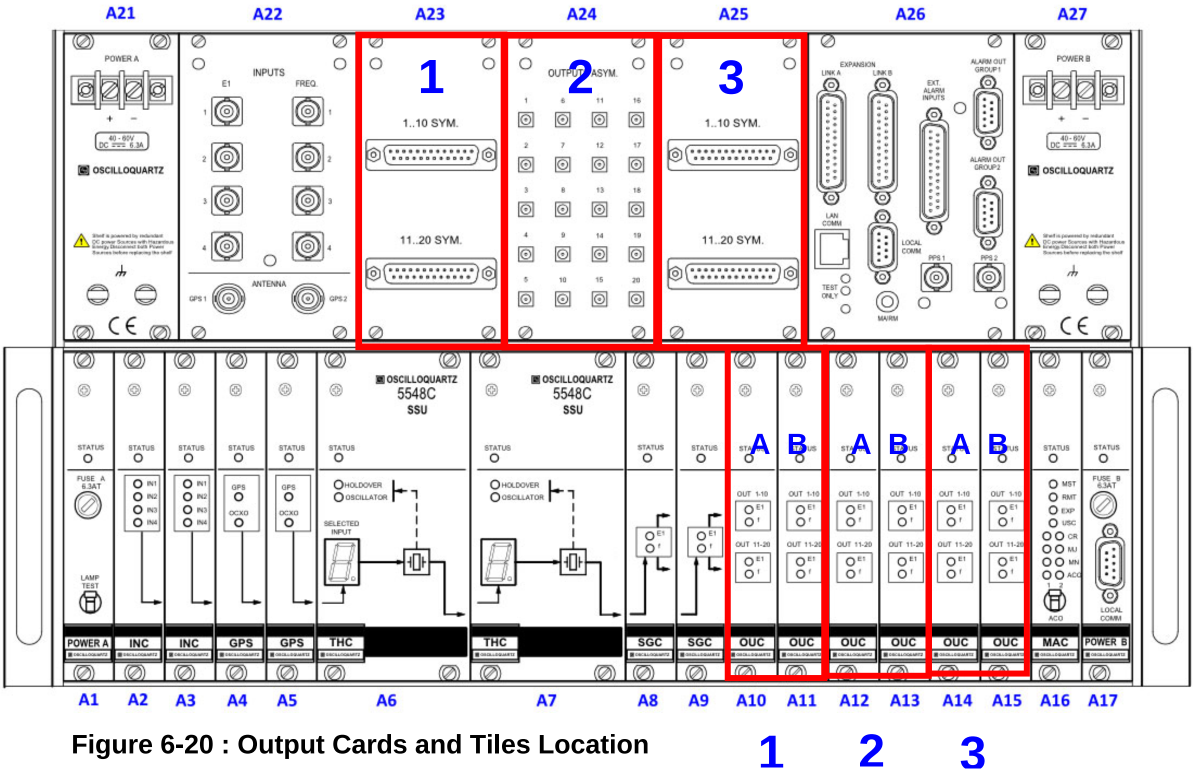


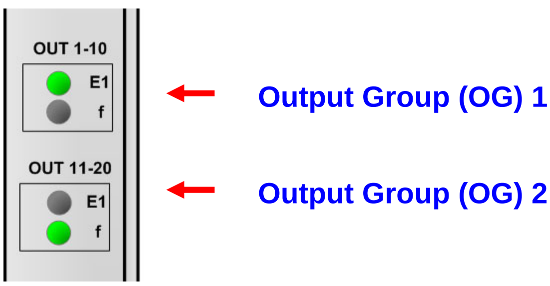
Figure 6-20 : Output Cards and Tiles Location

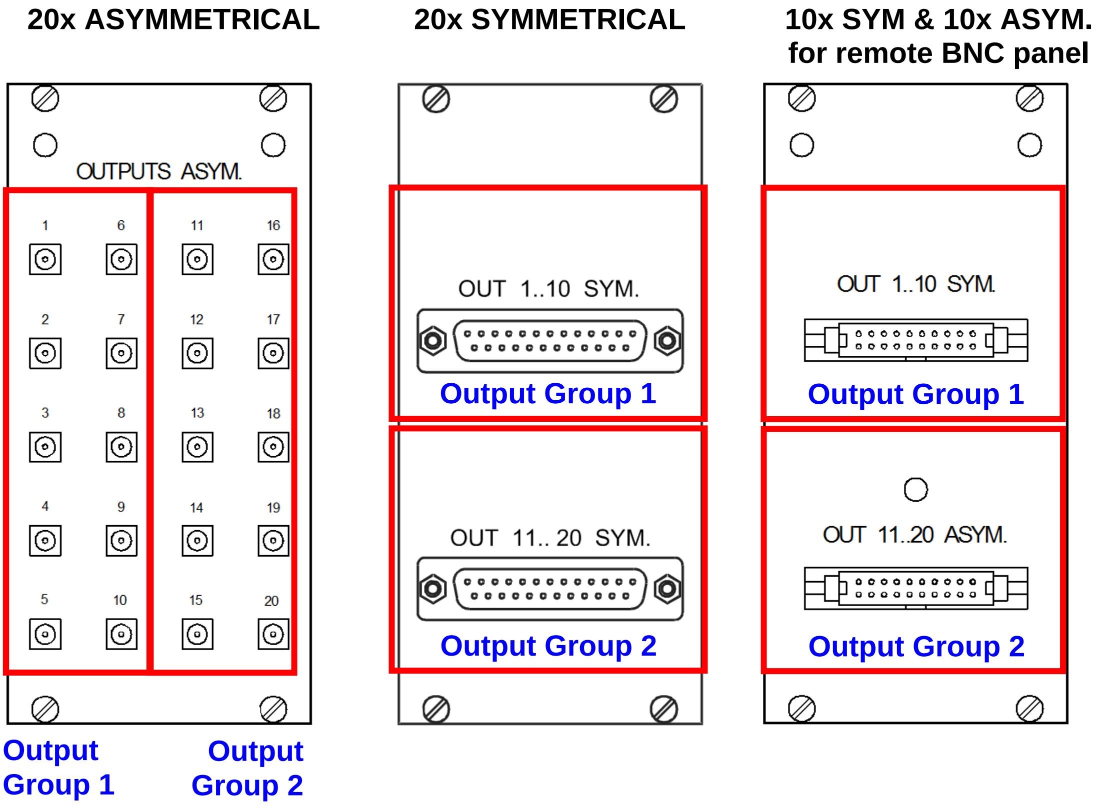
GROUP	OUC A slot no.	OUC B slot no.	Output Tile
1	A10	A11	A23
2	A12	A13	A24
3	A14	A15	A25

Table 6-13 Output Card Slot Numbers and TL1 Abbreviations

6.9.1.3 Output Group (OG) description

Each OUtput Card (OUC) provides 2 output groups (OG) of 10 output connectors.





The OG are labeled within the TL1 commands as shown below:

“OUC Group” – “Output Group”

In the table below, **“x”** is the OUC group number (1…3)

Output Group (OG)	TL1 Abbreviation
First output group (1…10)	x-1
Second output group (11…20)	x-2

Table 6-14 Output GroupTL1 Abbreviations

6.9.1.4 Output Line (OL) description

Each OUtput Card (OUC) provides 20 outputs lines that are labeled within the TL1 commands as shown below:

“OUC Group Number” – “Output Line”

In the table below, **"x"** is the output OUC Group number (1…3)

Output Group 1 (OUT 1…10)	
Output line	**TL1 Abbreviation**
#1	x-1
#2	x-2
#3	x-3
#4	x-4
#5	x-5
#6	x-6
#7	x-7
#8	x-8
#9	x-9
#10	x-10

Output Group 2 (OUT 11...20)	
Output line	**TL1 Abbreviation**
#11	x-11
#12	x-12
#13	x-13
#14	x-14
#15	x-15
#16	x-16
#17	x-17
#18	x-18
#19	x-19
#20	x-20

Table 6-15 Output Line TL1 Abbreviation

6.9.2 Signal Generation Card (SGC) Group State

The SGC cards treat the signal received from the THC(s) or directly from the INC Group when it is in pass-through operation mode and distribute it independently as the following signal types:

- E1 (option 1 & 2), 2.048 MHz, 1 PPS & 10MHz to each OUC group
- E1, 2.048 MHz and 1 PPS for expansion shelves (LINK A & B on the management connector tile)
- 1 PPS for the PPS output BNC connectors 1 & 2 on the management connector tile

***Note*:**

The distributed PPS signal is synchronized to the UTC (Universal Coordinated Time) only when at least one GPS Input card* is locked to GPS.

SSM state and SSM output properties

Parameters generated	Configuration
SSM	Enable or disable
OQL	SSM Output quality level

***Note*:**

The OQL parameter is the SSM status supplied on all E1 output ports

Properties of the signal generated for OUCs, NTP, PTP

Parameters generated	Configuration
E1 Option 1 status	**OK** if everything is running fine **Failure** if any problem **Squelch** if the system has cut the signal **Passthrough** if the system is in "Pass-through" mode
E1 Option 2 status	
2.048 MHz status	
10 MHz status	
PPS Timing	
PPS General	

*Not yet available

Note:

PPS General is for internal OSA 5548C SSU use only, i.e. to make the LEDs blink.

Properties of the signal generated for expansion shelves (LINK A & LINK B)

Parameters generated	Configuration
E1 status for expansion A	**OK** if everything is running fine **Failure** if any problem **Squelch** if the system has cut the signal **Passthrough** if the system is in "Pass-through" mode
E1 status for expansion B	
2.048 MHz status for expansion A	
2.048 MHz status for expansion B	
PPS status for expansion A	
PPS status for expansion B	

Note:

The 10 MHz frequency is not supplied to the expansion shelves because they are able to generate this frequency by using the others.

Signal properties for PPS outputs 1 & 2 on the Management connector tile

Parameters generated	Configuration
PPS output 1	**OK** if everything is running fine **Failure** if any problem **Squelch** if the system has cut the signal **Passthrough** if the system is in "Pass-through" mode
PPS output 2	

The following TL1 command is issued to retrieve the current status of the signal generation parameters:

Note:

The command response refers to the SGC group status and not to individual SGC card status.

Input Syntax

```
RTRV-EQPT-SGC:::ctag;
```

The response is formatted as below:

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "opstate:SSM=ssm,OQL=oql,SYS_MODE=sys_mode:e1_1,e1_2,e1_exp_a,
 e1_exp_b,freq_1,freq_exp_a,freq_exp_b,pps_gen,pps_timing,
 pps_exp_a,pps_exp_b,pps_out_1,pps_out_2,freq_2"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	EMPTY, EXTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are nine different SGC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from its respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SSM	OFF, ON	OFF	This is the SSM state, either enabled or disabled
OQL	PRC, SSU_A, SSU_B, SEC, DNU, FAILED, DISABLED	OK	This is the SSM quality level supplied by the SGC. This is also the SSM quality supplied by the 5548C
SYS_MODE	MST, EXP, INV	MST	5548C system mode. MST: MASTER shelf; EXP: EXPANSION shelf; INV: Invalid

Parameter name	Possible configurations	Default parameters	Description
E1_1	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the configuration nr.1 of the E1 generated for OUCs.
E1_2	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the configuration nr.2 of the E1 generated for OUCs.
E1_EXP_A	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the E1 generated for expansion shelf A (LINK A).
E1_EXP_B	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the E1 generated for expansion shelf B (LINK B).
FREQ_1	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the Frequency line nr.1 generated for OUCs.
FREQ_EXP_A	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the Frequency generated for expansion shelf A (LINK A).
FREQ_EXP_B	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the Frequency generated for expansion shelf B (LINK B).
PPS_GEN	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the PPS generated for internal 5548C use.
PPS_TIMING	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the PPS generated for OUCs (NTP/PTP).
PPS_EXP_A	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the PPS generated for expansion shelf A (LINK A).
PPS_EXP_B	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the PPS generated for expansion shelf B (LINK B).
PPS_OUT_1	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the PPS generated for the Management tile PPS output 1.
PPS_OUT_2	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the PPS generated for the Management tile PPS output 2.
FREQ_2	OK, FAIL, SQLCH, PTHRGH*	OK	This is the state of the Frequency line nr.2 generated for OUCs.

***** :

OK : correct functioning on the generated signal.

FAIL : This status is shown if any problem is encountered on the generated signal

SQLCH : if the system has cut the signal. Usually when both the THCs haven't ended their start-up procedure

PTHRGH : if the system is in "Passthrough" mode. (The signal is provided directly to the SGCs without passing through the THC)

6.9.3 OUtput Card Group State (OUC)

Send the following TL1 command to retrieve the current OUC card group status (1 to 3):

Note:

The command response refers to the OUC group status and not to individual OUC card status.

Note:

For OUC cards and Output Tile correspondence, refer to section 6.9.1.2

For Output Group information, refer to section 6.9.1.3

Input Syntax

```
RTRV-EQPT-OUC::aid:ctag;
```

Example:

```
RTRV-EQPT-OUC::3:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

       "aid:opstate,SHORTED=shorted"
;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1…3		This is the card group on which you want to retrieve or to edit the configuration

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	EMPTY, EXTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are nine different OUC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from its respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SHORTED	ON,OFF, -	OFF	When ON, OUC group detects and generates an alarm if any of its output lines are shorted (short-circuit). “-“, when no cards are active.

6.9.4 Output Signal Type and Configuration

Different output signal types can be supplied by the OSA 5548C SSU through its OUC (OUtput Card) cards.

For the output signal type configuration (i.e. 2.048MHz, E1), the OSA 5548C SSU has to be configured by software.

3 configuration types can be applied to each of the Output Group (OG), as follow:

- 2.048MHz according to ITU-T G.703.13
- E1 configuration nr.1 according to ITU-T G.703.9
- E1 configuration nr.2 according to ITU-T G.703.9

The E1 configuration nr.1 and nr.2 are customizable by software and allow the user to:

- select the code type (HDB3 or AMI)
- enable CRC-4
- configure the Time Slot 16 (TS16) structure (CCS, CAS)
- configure Sa bits
- configure the Idle code

The next sections describe how to configure the 5548C to supply the Output Signal Required.

6.9.4.1 Customization of E1 Configurations nr.1 and nr.2

Note:

Only one Sa bit can be configured as SSM!

Warning:

Do not set an idle code which has very few binary pulses (0x00, 0x01, 0x10). This configuration can introduce SGC and OUC output alarm.

Using TL1

To retrieve current setting of the E1 configuration nr.1 and nr.2, use the following command.

Input Syntax

```
RTRV-EQPT-SGE::aid:ctag;
```

Example:

```
RTRV-EQPT-SGE::E1-1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

      "aid:CODE=code,CRC4=crc4,TS16=ts16,SA4=sa4,SA5=sa5,SA6=s
      a6,SA7=sa7,SA8=sa8,IDLE=idle"
 ;
```

To set any of the two E1 configuration option, use the command below.

Input Syntax

```
ED-EQPT-SGE::aid:ctag::[CODE=code],[CRC4=crc4],[TS16=ts16],
[SA4=sa4],[SA5=sa5],[SA6=sa6],[SA7=sa7],[SA8=sa8],[IDLE=idle];
```

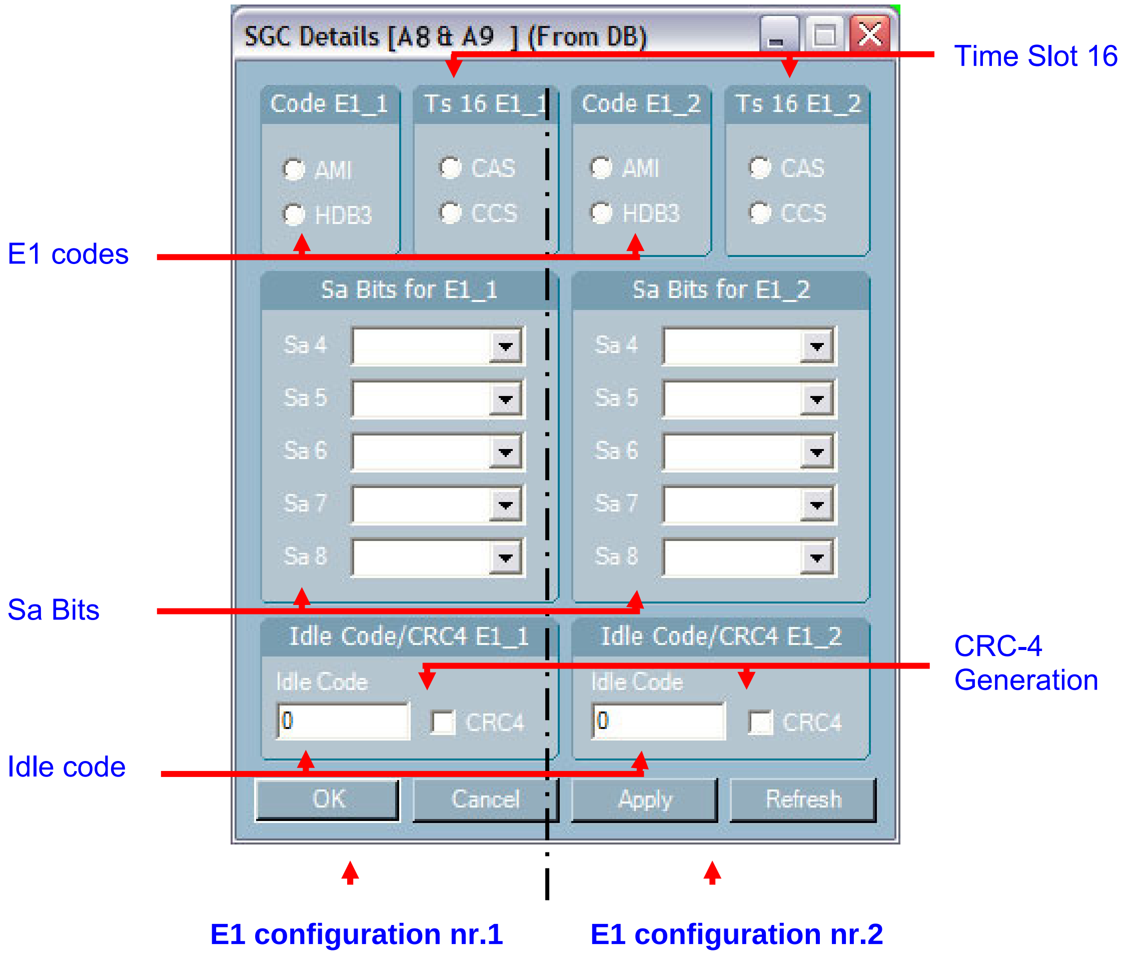
Example:

```
ED-EQPT-SGE::E1-1:MYCTAG::CODE=HDB3,CRC4=ON,TS16=CAS,
SA4=SSM,SA5=ON,SA6=ON,SA7=ON,SA8=ON,IDLE=255;
```

Parameter name	Possible configurations	Default parameters	Description	
AID	E1-1, E1-2		This is the configuration. E1-1 is configuration nr.1 and E1-2 the nr.2	
CODE	HDB3, AMI	HDB3	E1 code	
CRC4	OFF, ON	ON	CRC-4 generation	
TS16	CCS, CAS	CAS	Time Slot 16 structure	
SA4	OFF, ON, SSM	SSM	Sa4 bit	ON: the Sa bit is enabled SSM: Configure the Sa bit to carry the SSM
SA5	OFF, ON, SSM	ON	Sa5 bit	
SA6	OFF, ON, SSM	ON	Sa6 bit	
SA7	OFF, ON, SSM	ON	Sa7 bit	
SA8	OFF, ON, SSM	ON	Sa8 bit	
IDLE	0..255	255	Idle code of Time Slots (TS) 1 to 15 and 17	

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *SGC* → *Details*



<table>
<tr><th>Parameter name</th><th>Possible configurations</th><th colspan="2">Description</th></tr>
<tr><td>CODE</td><td>HDB3, AMI</td><td colspan="2">E1 code</td></tr>
<tr><td>CRC4</td><td>OFF, ON</td><td colspan="2">CRC-4 generation</td></tr>
<tr><td>TS 16</td><td>CCS, CAS</td><td colspan="2">Time Slot 16 structure</td></tr>
<tr><td>SA4</td><td>OFF, ON, SSM</td><td>Sa4 bit</td><td rowspan="5">ON: the Sa bit is enabled

SSM: Configure the Sa bit to carry the SSM</td></tr>
<tr><td>SA5</td><td>OFF, ON, SSM</td><td>Sa5 bit</td></tr>
<tr><td>SA6</td><td>OFF, ON, SSM</td><td>Sa6 bit</td></tr>
<tr><td>SA7</td><td>OFF, ON, SSM</td><td>Sa7 bit</td></tr>
<tr><td>SA8</td><td>OFF, ON, SSM</td><td>Sa8 bit</td></tr>
<tr><td>IDLE</td><td>0..255</td><td colspan="2">Idle code of Time Slots (TS) 1 to 15 and 17</td></tr>
</table>

6.9.4.2 Configuring Output Group (OG)

Note:

For OUC cards and Output Tile correspondence, refer to section 6.9.1.2

For Output Group information, refer to section 6.9.1.3

Using TL1
To retrieve the configuration of one of the two OG from an OUC group, use the following command.

Input Syntax

```
RTRV-EQPT-OG::aid:ctag;
```

Example:

```
RTRV-EQPT-OG::3-1:MYCTAG;
```

The response will answer as shown below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

       "aid:TYPE=type"
 ;
```

To configure the OG with one of the three configurations (2.048MHz, E1 configuration nr.1 or E1 configuration nr.2) use the following command.

Input Syntax

```
ED-EQPT-OG::aid:ctag::TYPE=type;
```

Example:

```
ED-EQPT-OG::2-1:MYCTAG::TYPE=E1_2;
```

The response will answer as shown below.

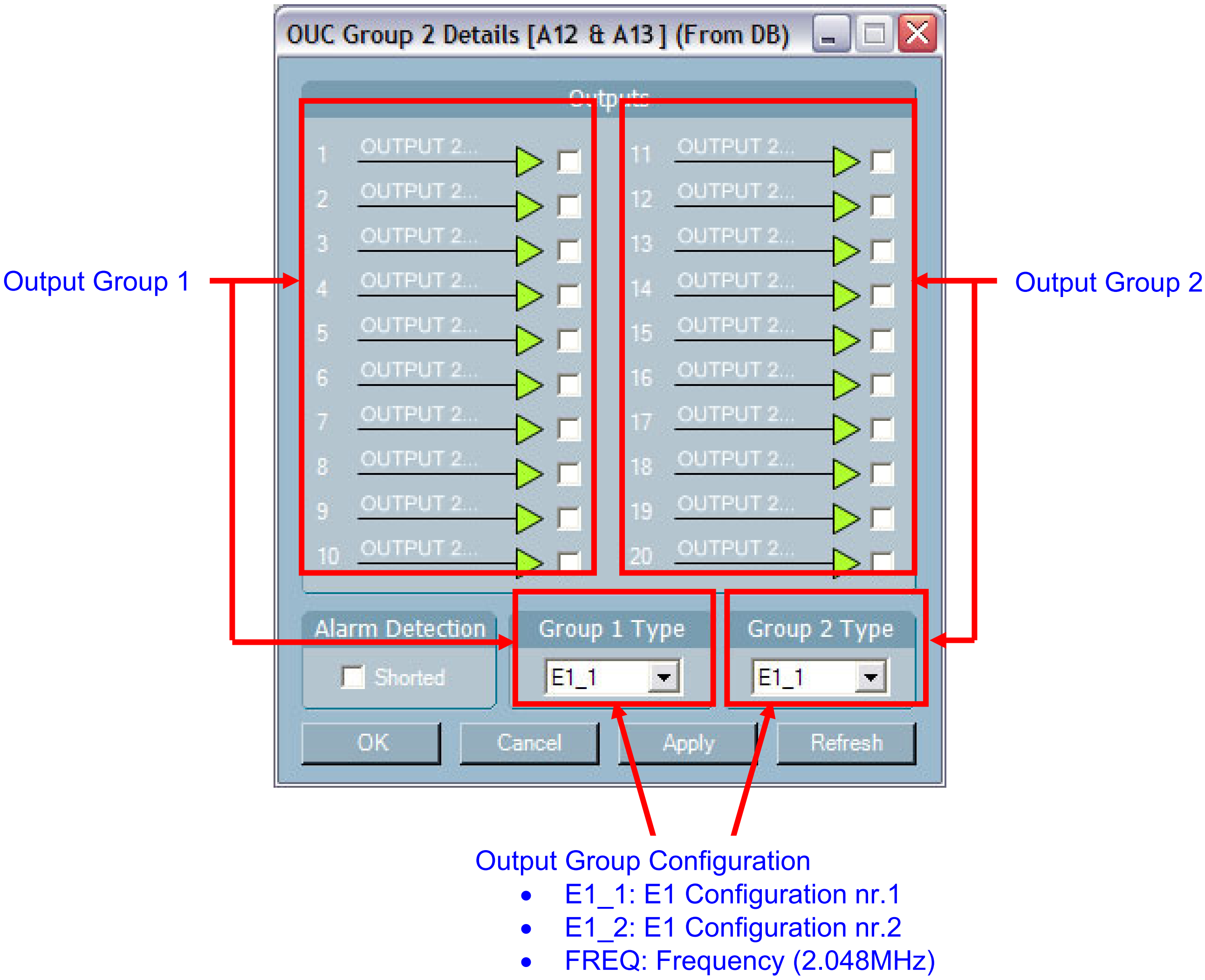
Output Syntax

```
       sid   date  time
 M     ctag  COMPLD
       "aid:TYPE=type"
 ;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…3-2		This is the OG specified, in the format X-Y. X is the OUC group and Y the OG.
TYPE	E1_1, E1_2, FREQ	E1_1	Configuration specified for the OG

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Outputs* → *Group 1…3 Details*



6.9.4.3 Output Line (OL) Configuration (Squelch & Tag)

In this section it is explained how to retrieve the current status for any of the 20 output lines from any OUC group.

Note:

For OUC cards and Output Tile correspondence, refer to section 6.9.1.2

For Output Group information, refer to section 6.9.1.3

Using TL1

The following TL1 command is required to find the actual OUC group configuration.

Input Syntax

```
RTRV-EQPT-OL::aid:ctag;
```

Example:

```
RTRV-EQPT-OL::3-15:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

       "aid:opstate,SQUELCH=squelch,TAG=\"My Tag up-to 32
       chars.\""
 ;
```

To squelch an output line and/or to edit a Tag, the following TL1 command is required.

Input Syntax

```
ED-EQPT-OL::aid:ctag::[SQUELCH=squelch],[TAG=tag];
```

Example:

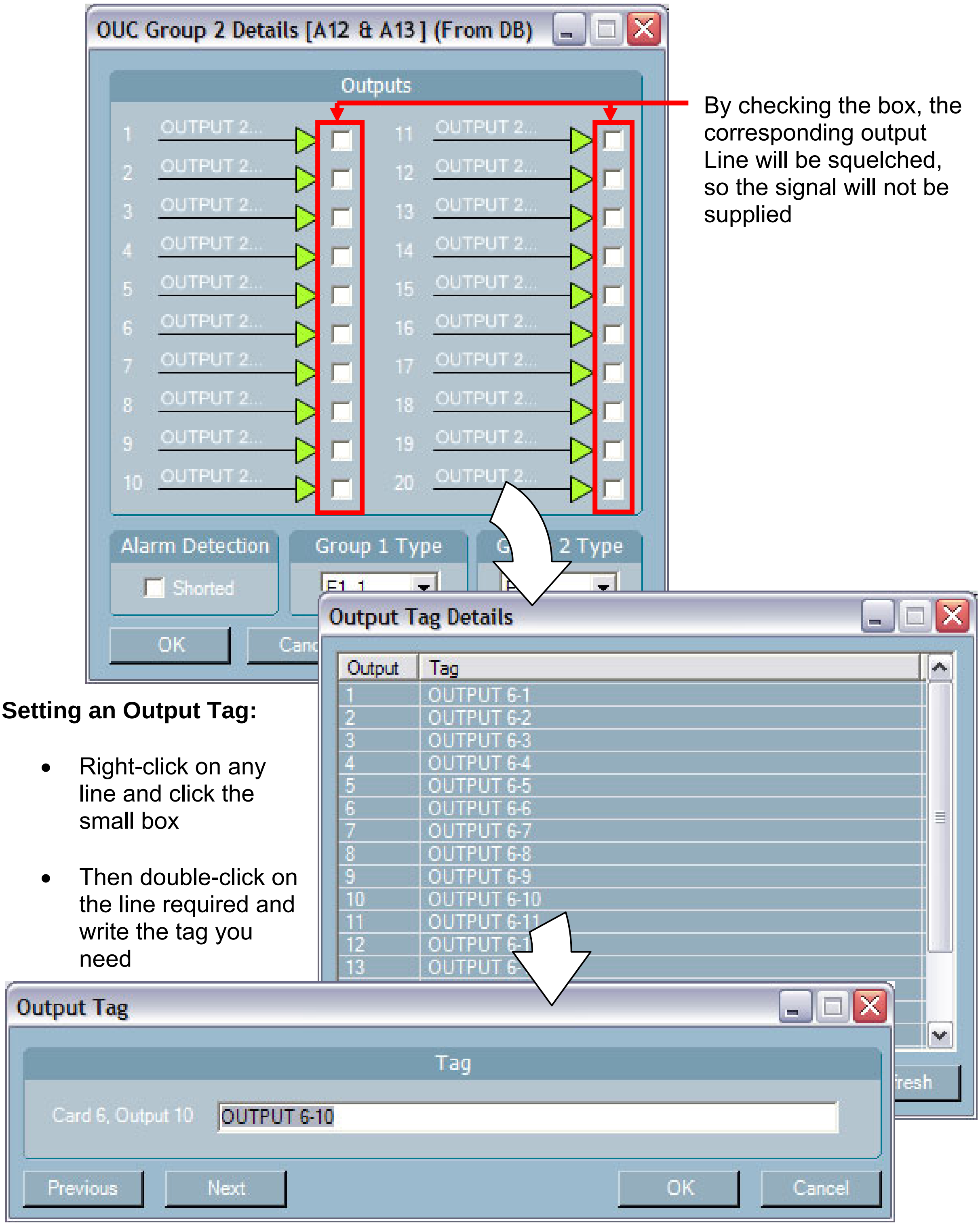
```
ED-EQPT-OL::2-8:MYCTAG::OFF,TAG="OL 8 of OUC 2";
```

Parameter name	Possible configurations	Default parameters	Description
AID	1-1…3-20		Output Line (OL) specified in the format X-Y. X is the OUC group, Y is the OL.
OPSTATE*	OK, ALARM, SHORTED, SQUELCHED	OK	This is the status of the output line
SQUELCH	ON, OFF	ON	This is the output line squelch condition. **OFF:** the signal is supplied **ON:** the signal is squelched
TAG	\”My Tag up-to 32 chars.\”		Double-quoted tag with up to 32 characters, alphabetic upper and lower case, numeric and punctuation

*: not software configurable

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Outputs* → *Group 1…3 Details*



By checking the box, the corresponding output Line will be squelched, so the signal will not be supplied

Setting an Output Tag:

- Right-click on any line and click the small box
- Then double-click on the line required and write the tag you need

6.9.4.4 Short-Circuit Detection on OL

The OSA 5548C has the capability to show a SHORTED alarm when it detects short circuit on any of an OUC's Output Lines. To enable this function on any of the OUC group, follow this procedure.

Note:

For OUC cards and Output Tile correspondence, refer to section 6.9.1.2

For Output Group information, refer to section 6.9.1.3

Using TL1

To retrieve the current OUC state, use the following command.

Input Syntax

```
RTRV-EQPT-OUC::aid:ctag;
```

Example:

```
RTRV-EQPT-OUC::3:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

      "aid:opstate:SHORTED=shorted"
;
```

To enable the SHORT CIRCUIT detection, send the below command.

Input Syntax

```
ED-EQPT-OUC::aid:ctag::SHORTED=shorted;
```

Example:

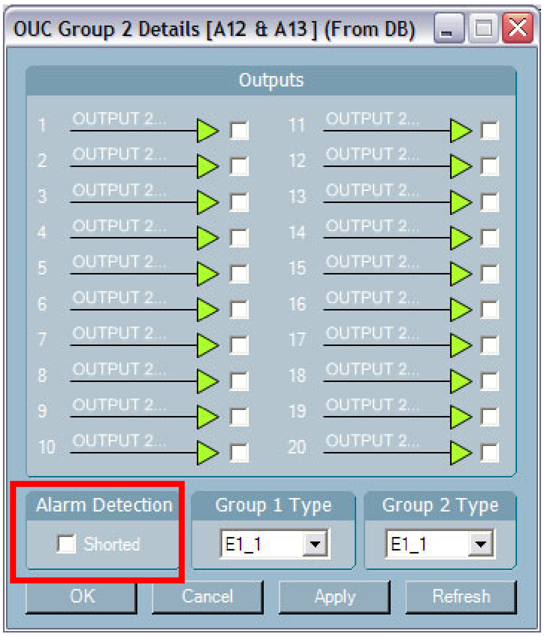
```
ED-EQPT-OUC::2:MYCTAG::SHORTED=ON;
```

Parameter name	Possible configurations	Default parameters	Description
AID	1…3		This is the card group specified

Parameter name	**Possible configurations**	**Default parameters**	**Description**
OPSTATE*	EMPTY, EXTRACTED, INIT, DOWNLOAD, OK, ALARM, DEGRADED, TESTERROR, DEAD	OK	There are nine different OUC group states: **EMPTY**: The group slots are empty **EXTRACTED**: The group has been extracted from its respective slots **INIT**: The group is being restarted **DOWNLOAD**: The group firmware is being downloaded **OK**: The group is running correctly **ALARM**: The group is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date **DEAD**: The MAC group is not able to communicate
SHORTED	ON,OFF, -	OFF	When ON, OUC group detects and generates an alarm if any of its output lines are shorted (short-circuit). "-", when no card is inserted.

*: not software configurable

Using SyncView
Open the *Physical* or *Logical View* → *Elements* → *Outputs* → *Group 1…3 Details*



Check the "Shorted" Checkbox to enable the Shorted alarm detection on all the 20 output lines related to the OUC group.

6.9.5 Time Code Card - NTP (TCC-NTP) State

Depends on network configuration, the NTP signal can be supplied by an NTP server or directly form the GPS card available in the 5548C.
Usually, the TCC-NTP card is plugged in one of the OUC (OUtput Card) group slot. The NTP Output connector can be in front panel card access, on the front tile set or on the output remote panel (for E200).

Each TCC-NTP provides one NTP output.

This section describes how to configure the 5548C to supply the NTP signal.

First of all the general settings must be configured in correspondence to the network.

IP Address
Net Mask
Gateway
DHCP mode
Ethernet Speed Selection
Ethernet Speed
Duplex mode

Using TL1
To retrieve current setting of the TCC-NTP

Input Syntax

```
RTRV-EQPT-TCC::aid:ctag;
```

Example:

```
RTRV-EQPT-TCC::TCC-1-A:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
        sid   date  time
 M      ctag  COMPLD

        "aid:IPADDRESS=xxx.xxx.xxx.xxx,NETMASK=xxx.xxx.xxx.xxx,
        GATEWAY=xxx,xxx,xxx,xxx,DHCP_MODE=ENABLED,ETHER_SDEF=MAN
        UAL,ETHER_SPEED=100,DUPLEX_MODE=FULL"
        ;
```

To set any of the two E1 configuration option, use the command below.

Input Syntax

```
ED-EQPT-TCC::
aid:CTAG::[IPADDRESS=###.###.###.###],[NETMASK=###.###.###.###
],[GATEWAY=###.###.###.###],[DHCP_MODE=ENABLED/DISABLED],[ETHE
R_SDEF=AUTO/MANUAL],[ETHER_SPEED=10/100],[DUPLEX_MODE=HALF/FUL
L];
```

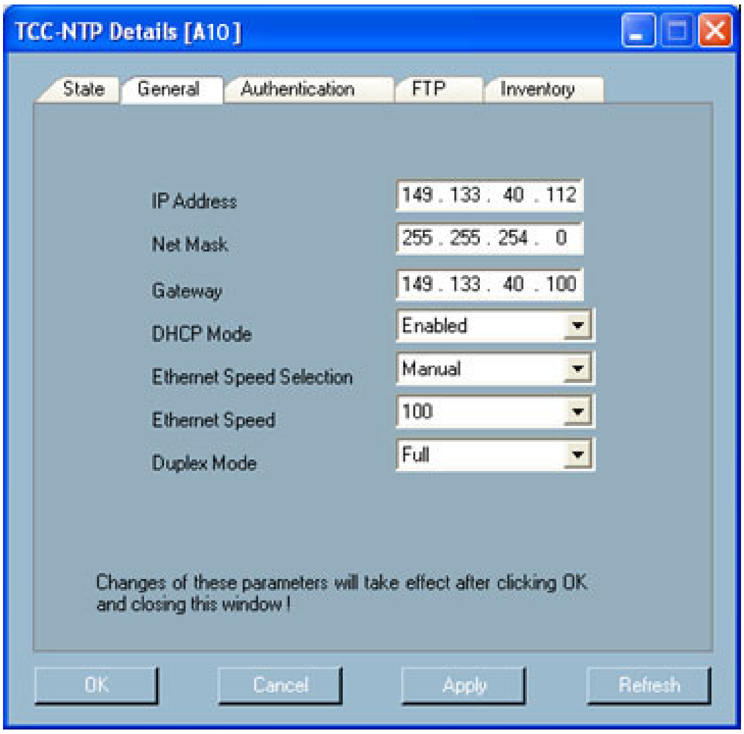
Example:

```
ED-EQPT-TCC::TCC-1-
A:MYCTAG::IPADDRESS=123.100.124.120,GATEWAY=123.100.124.100,DH
CP_MODE=ENABLE,ETHER_SDEF=AUTO,DUPLEX_MODE=FULL;
```

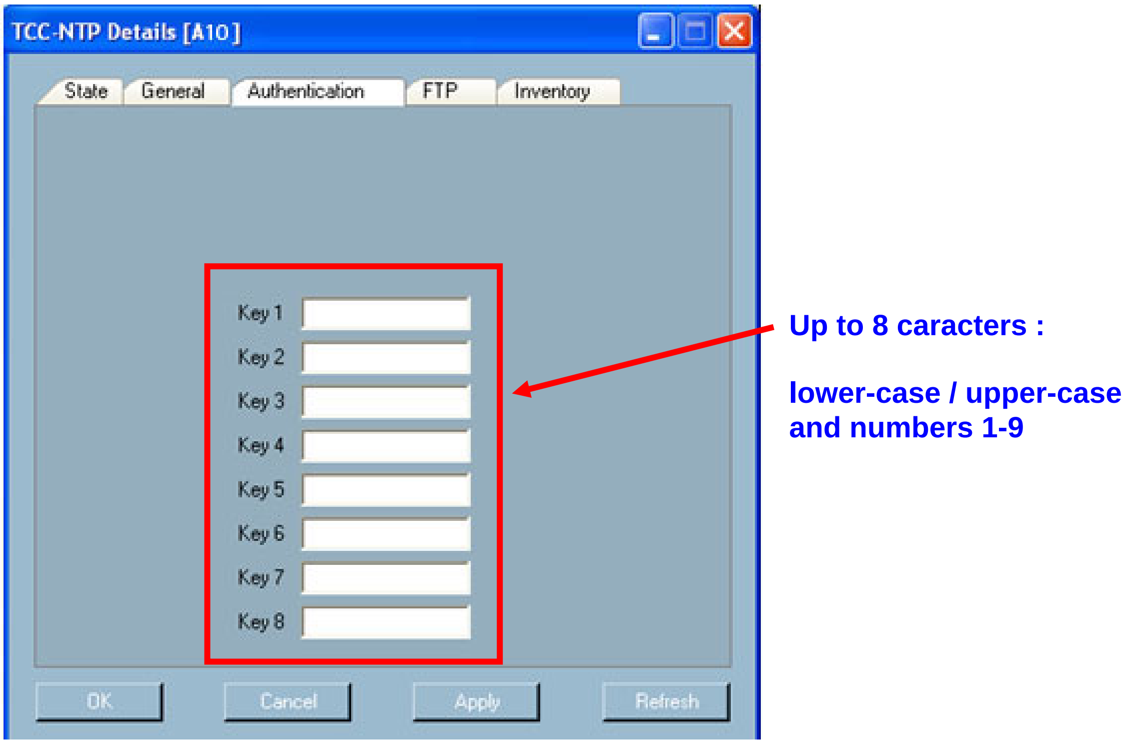
Parameter name	Possible configurations	Default parameters	Description
AID	TCC-1-A .. TCC-3-B		Card position
IPADRESS	xxx.xxx.xxx.xxx x :0 to 9	**10.16.1.143**	-
GATEWAY	xxx.xxx.xxx.xxx x :0 to 9		-
DHCP_MODE	ENABLE/DISABLE	ENABLE	-
ETHER_SPEED	10 / 100	AUTO	-
DUPLEX_MODE	HALF / FULL	FULL	-

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *TCC* → *Details*

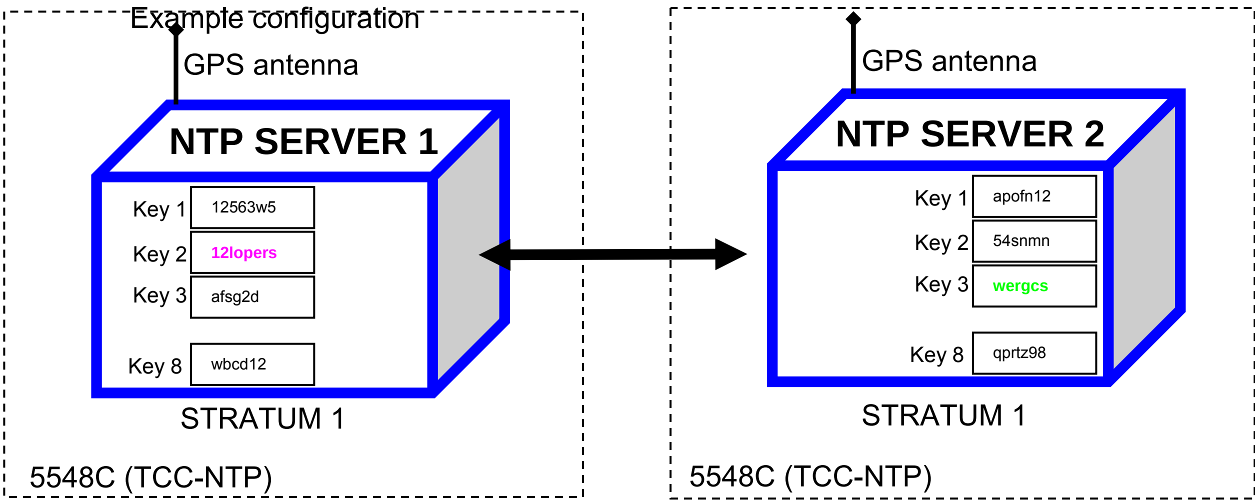


The next sections describe how to configure the TCC-NTP



NTP authentication adds a level of security to your NTP configuration. You configure an NTP key string on each device. The key is encrypted using a Message Digest 5 (MD5) hashing algorithm, and the encrypted key is passed in each NTP packet. Before an NTP packet is processed, the key is checked against the configured key on the receiving device.

Example configuration



6.9.6 Using the Time Code Card - PTP (TCC-PTP)

Configuring a network to use the TCC-PTP card basically consists of the following steps:

- IP configuration;
- PTP parameters configuration on the Grandmaster.
- PTP parameters configuration on the slaves, if any.

6.9.6.1 PTP Port

The SFP connector cage on the front panel hosts the SFP transceiver corresponding to the network in use: electrical or optical. Oscilloquartz supplies SFP transceivers upon request. The user may optionally integrate his own transceivers but without any warranty on the performances.

The TCC-PTP has only one PTP port. Thus, the port number, asked by several TL1 commands, shall always be 1.

6.9.6.2 IP Configuration

Configuring the PTP port IP settings is possible with the ED-EQPT-PTPC-IP TL1 command. These settings are used when the PTP transmission protocol is configured to use UDP/IP.

TL1 Syntax

```
ED-EQPT-PTPC-IP:[TID]:PTPC-1-A..PTPC-10-
B:CTAG::PORT=1..2,[IPADDRESS=###.###.###.###],[NETMASK=###.###.
###.###],[GATEWAY=###.###.###.###],[DHCP_MODE=ENABLED/DISABLED]
,[ETHER_SDEF=AUTO/MANUAL],[ETHER_SPEED=10/100/1000],[DUPLEX_MOD
E=HALF/FULL];
```

Example:

```
ED-EQPT-PTPC-IP::PTPC-1-
A:A::PORT=1,IPADDRESS=145.133.40.122,NETMASK=255.255.255.0,GATE
WAY=145.133.40.122,DHCP_MODE=DISABLED;
```

Parameters descriptions

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
IPADRESS	xxx.xxx.xxx.xxx x :0..255	10.16.1.108	PTP port IP address
GATEWAY	xxx.xxx.xxx.xxx x :0..255	10.16.1.1	PTP port gateway
NETMASK	xxx.xxx.xxx.xxx x :0..255	255.255.254.0	PTP port netmask
DHCP_MODE	ENABLE/DISABLE	DISABLE	If ENABLED, the card asks request its own IP settings to a DHCP server.
ETHER_SPEED	100/1000	AUTO	The current release allows only 1Gb connections. Ask Oscilloquartz for 100Mb availability.
DUPLEX_MODE	HALF / FULL	FULL	Configuring the PTP port in HALF duplex mode may worse PTP performances.

Retrieving the Ethernet/IP configuration
The RTRV-EQPT-PTPC-IP TL1 command can be used to retrieve and verify the Ethernet/IP configuration.

TL1 Syntax

```
RTRV-EQPT-PTPC-IP:[TID]:PTP-1-A..PTP-10-B:CTAG::PORT=1..2;
```

Example:

```
RTRV-EQPT-PTPC-IP::PTP-1-A:MYCTAG::PORT=1;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
 M     ctag  COMPLD

"aid:IPADDRESS=###.###.###.###,NETMASK=###.###.###.###,GATEWAY=
###.###.###.###,DHCP_MODE=ENABLED,ETHER_SDEF=MANUAL],ETHER_SPEE
D=1000,DUPLEX_MODE=FULL;
```

6.9.6.3 PTP Configuration

The ED-EQPT-PTPC-PTP TL1 command can be used to configure the PTP parameters.

TL1 Syntax

```
ED-EQPT-PTPC-PTP:[TID]:PTP-1-A..PTP-10-B:CTAG::PORT=1..2,[ADM_STATE=ENABLED/DISABLED],[ADDR_MODE=UNICAST/MULTICAST/MIXED],[DOMAIN=0..99],[PROTOCOL=UDP/ETHERNET],[TWOSTEP=NO/YES],[MASTER_STATE=ENABLED/DISABLED],[SLAVE_STATE=ENABLED/DISABLED],[ALTERNATE_MASTERS=0..255];
```

Example:

```
ED-EQPT-PTPC-PTP:[TID]:PTP-1-A..PTP-10-B:MYCTAG::PORT=1,ADM_STATE=ENABLED,ADDR_MODE=MIXED,DOMAIN=5,PROTOCOL=UDP,MASTER_STATE=ENABLED,SLAVE_STATE=DISABLED,ALTERNATE_MASTERS=1;
```

Parameters descriptions

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
ADM_STATE	ENABLED/DISABLED	Enabled	The PTP port may be administratively disabled. In that case, no PTP traffic will be generated.
ADDR_MODE	UNICAST MULTICAST MIXED	UNICAST	In MIXED mode both UNICAST and MULTICAST packets are sent to through the PTP port.
DOMAIN	0..99	0	PTP domain as specified by IEEE 1588v2
PROTOCOL	ETHERNET/UDP	UDP	Transmission protocol
TWOSTEP	NO/YES	NO	Two step mode makes use of FollowUp messages. It can be used if the slave doesn’t support the ONE STEP mode.
MASTER_STATE	ENABLED	ENABLED	Use ENABLED only
SLAVE_STATE	DISABLED	DISABLED	Use DISABLED only
ALTERNATE_MASTER	0..255	0	In MULTICAST mode configures the number of active MASTERs in the same domain.If ALTERNATE_MASTER =0, only one MASTER may be active.

Retrieve the PTP configuration

```
RTRV-EQPT-PTPC-PTP
```

Syntax:
```
RTRV-EQPT-PTPC-PTP:[TID]:PTP-1-A..PTP-10-B:CTAG::PORT=1..2;
```

Example:
```
RTRV-EQPT-PTPC-PTP::PTP-1-A-:MYCTAG::PORT=1;
```

Answer:
TEST 11-03-15 15-17-32
```
M   a COMPLD
   "PTPC-2-
A:PORT=1,PORT_STATE=PASSIVE,ADM_STATE=ENABLE,ADDR_MODE=UNICAST,
DOMAIN=1,PROTOCOL=UDP,TWOSTEP=NO,MASTER_STATE=ENABLED,SLAVE_STA
TE=DISABLED, ALTERNATE_MASTERS=0 "
```

6.9.6.4 PTP Source parameters

Edits the PTP card Reference Source parameters.

TL1 Syntax

```
ED-EQPT-PTPC-
REF:[tid]:aid:ctag::REF=ref,[TIME_SOURCE=time_source],[ACCURACY
=accuracy],[LOG_VARIANCE=log_variance];
```

Parameters descriptions

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
REF	1..2	1	TCC-PTP user shall enter 1.
TIME_SOURCE	ATOMIC_CLOCK / GNSS / TERRESTRIAL_RADIO / NTP / HANDSET / OTHER / INTERNAL_OSCILLATOR	GNSS	Time source
ACCURACY	25NS, 100NS, 250NS, 1US, 2_5US, 10US, 25US,100US,250US, 1MS, 2_5MS 10MS,25MS, 100MS, 250MS,1S, 10S,GT10S	100ns	PTP accuracy as defined by Table 6of IEEE-1588v2
LOG_VARIANCE	0..65535	65535	OffsetScaledLogVariance as per IEEE-1588v2

Input Example:

```
ED-EQPT-PTPC-REF::PTP-1-
A:MYCTAG::REF=1,TIME_SOURCE=ATOMIC_CLOCK,
ACCURACY=25NS,LOG_VARIANCE=65535;
```

Output Syntax:

```
   sid date time
M  ctag COMPLD
;
```

Output Parameter(s):

None.

Output Example:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
;
```

6.9.6.5 PTP UTC Offset

Configures the number of seconds to add to UTC time.

Input Syntax:

```
ED-PTP-UTC-OFFSET:[tid]:PTP-1-
A:ctag::OFFSET=offset,VALID=valid;
```

Input Parameter(s):

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
OFFSET	4..255	35	Offset
VALID	TRUE/FALSE	TRUE	PTP-UTC offset is valid

Input Example:

```
ED-PTP-UTC-OFFSET::PTP-1-A:MYCTAG::OFFSET=34,VALID=TRUE;
```

Output Syntax:

```
   sid date time
M  ctag COMPLD
;
```

Output Parameter(s):

None.

Output Example:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
;
```

6.9.6.6 ED-EQPT-PTPC

Edit TCC-PTP Card configuration.

Input Syntax:

```
ED-EQPT-
PTPC:[tid]:aid:ctag::TIMESCALE=timescale,[ALT_INPUT=alt_input],
[TIME_REFERENCE=time_reference];
```

Input Parameter(s):

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
TIMESCALE	PTP, ARB	PTP	According to IEEE-1588v2
ALT_INPUT	ENABLE / DISABLE	DISABLE	PTP-UTC offset is valid
TIME_REFERENCE	GNSS, SYS, NTP, PTP	GNSS	Inform the PTP card of it time source

Input Example:

```
ED-EQPT-PTPC::PTP-1-
A:MYCTAG::TIMESCALE=PTP,ALT_INPUT=ENABLED,TIME_REFERENCE=GNSS;
```

Output Syntax:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
   ""
;
```

Output Parameter(s):

None.

Output Example:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
;
```

6.9.6.7 ED-EQPT-PTPC-GMLIMITS

Edit the Grandmaster limits configuration.

Input Syntax:

```
ED-EQPT-PTPC-
GMLIMITS:[tid]:aid:ctag::[MAX_SLAVE_NUM=max_slave_num],[SLAVE_N
UM_ALM_THRESHOLD=slave_num_alm_threshold];
```

Input Parameter(s):

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
MAX_SLAVE_NUM	0..128	128	Maximum number of supported slaves. Exceeding the value shall set the GM_SLAVE_NUM_EXCEEDED with severity CRITICAL.
SLAVE_NUM_ALM_THRESHOLD	0.. MAX_SLAVE_NUM	80	Shall be lower or equal to MAX_SLAVE_NUM. Exceeding the value shall set the GM_SLAVE_NUM_EXCEEDED with severity MAJOR. If the alarm is set and the number of slaves falls behind the threshold , the alarm is cleared.

Input Example:

```
ED-EQPT-PTPC-GMLIMITS::PTP-1-
A:MYCTAG::MAX_SLAVE_NUM=128,SLAVE_NUM_ALM_THRESHOLD=120;
```

Output Syntax:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
;
```

Output Parameter(s):

None.

Output Example:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
;
```

6.9.6.1 PTP card reference Source State

Retrieves the PTP card Reference Source State.

Input Syntax

```
RTRV-EQPT-PTPC-REF-STATE:[tid]:aid:ctag::REF=ref;
```

Input Example:

```
RTRV-EQPT-PTPC-REF-STATE::PTP-1-A:MYCTAG::REF=1;
```

Output Syntax:

```
   sid date time
M  ctag COMPLD
   "PTP-1-
A:REF=ref,IS_TAI=is_tai,CLOCK_CLASS=clock_class,TIME_SOURCE=tim
e_source,
ACCURACY=accuracy,LOG_VARIANCE=log_variance"
;
```

Parameters descriptions

Parameter name	Possible configurations	Default parameters	Description/Remarks
REF	1..2	1	TCC-PTP user shall enter 1.
IS_TAI	TRUE/FALSE		Clock Class
TIME_SOURCE	ATOMIC_CLOCK / GNSS / TERRESTRIAL_RADIO / NTP / HANDSET / OTHER / INTERNAL_OSCILLATOR	GNSS	Time source
ACCURACY	25NS, 100NS, 250NS, 1US, 2_5US, 10US, 25US,100US,250US, 1MS, 2_5MS 10MS,25MS, 100MS, 250MS,1S, 10S,GT10S	100ns	PTP accuracy as defined by Table 6of IEEE-1588v2
LOG_VARIANCE	0..65535	65535	OffsetScaledLogVariance as per IEEE-1588v2

Output Example:

```
   MY5548C 04-06-14 23:17:46
M  MYCTAG COMPLD
   "PTP-1-
A:REF=1,IS_TAI=FALSE,CLOCK_CLASS=21,TIME_SOURCE=ATOMIC_CLOCK,
ACCURACY=100NS,LOG_VARIANCE=65535"
;
```

6.9.6.2 PTP Multicast Configuration

The ED-EQPT-PTPC-MCAST TL1 command allows setting the multicast message rates.

Multicast addresses
In MIXED and MULTICAST mode PTP packets are sent to the following addresses according to the transmission protocol:

Ethernet: 224.0.1.129
UDP/IP: 01:1B:19:00:00:00

TL1 Syntax

```
ED-EQPT-PTPC-MCAST:[TID]:PTP-1-A..PTP-10-
B:CTAG::PORT=1..2,ANNOUNCE_LOG2PERIOD=-7..3,SYNC_LOG2PERIOD=-
7..3,DELAY_LOG2PERIOD=-7..3;
```

Example

```
ED-EQPT-PTPC-MCAST::PTP-1-
A:MYCTAG::PORT=1,ANNOUNCE_LOG2PERIOD=-5,SYNC_LOG2PERIOD=-
5,DELAY_LOG2PERIOD=-5;
```

LOG2PERIOD is: $1/2^{N}$ so if N=-5, the message is sent $1/2^{-5}$ = 32 times per second.

NOTE: the current version of TCC-PTP can accept values between 3 and -6.

The Multicast configuration can be retrieved with the command RTRV-EQPT-PTPC-MCAST

TL1 Syntax

```
RTRV-EQPT-PTPC-MCAST:[TID]:PTP-1-A..PTP-10-B:CTAG::PORT=1..2;
```

Example

```
RTRV-EQPT-PTPC-MCAST::PTP-1-A:MYCTAG::PORT=1;
```

Answer:

```
   TEST 11-03-15 15-17-32
M  a COMPLD
   "PTPC-2-A:PORT=1,ANNOUNCE_LOG2PERIOD=-1,SYNC_LOG2PERIOD=-
5,DELAY_LOG2PERIOD=-5"
;
```

Parameters descriptions

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
PORT	1,2	1	TCC-PTP user shall enter 1.
ANNOUNCE_LOG2PERIOD	-7..3	1	Used by the Best Master Clock Algorithm for master election.
SYNC_LOG2PERIOD	-7..3	0	Used by the Best Master Clock Algorithm for master election.
DELAY_LOG2PERIOD	-7..3	0	Clock class value sent in the Announce messages when the shelf and the TCC-PTP card are locked.

Clock Quality Configuration

The ED-EQPT-PTPC-PRIO TL1 command allows configuring several parameters concerning the PTP clock quality.

TL1 Syntax

```
ED-EQPT-PTPC-PRIO:[TID]:PTP-1-A..PTP-10-
B:CTAG::REF=1..2,[PRIO1=0..254],[PRIO2=0..254],[TRACKED_CLOCK_C
LASS=0..254],[HLDVR_CLOCK_CLASS=0..254],[FREERUN_CLOCK_CLASS=0.
.254];
```

Example

```
ED-EQPT-PTPC-PRIO::PTP-1-
A:MYCTAG::REF=1,PRIO1=127,PRIO2=127,TRACKED_CLOCK_CLASS=6,HLDVR
_CLOCK_CLASS=7,FREERUN_CLOCK_CLASS=52;
```

Parameters descriptions

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
REF	1,2	1	TCC-PTP user shall enter 1.
PRIO1	0..254	128	Used by the Best Master Clock Algorithm for master election.
PRIO2	0..254	128	Used by the Best Master Clock Algorithm for master election.
TRACKED_CLOCK_CLASS	0..254	6	Clock class value sent in the Announce messages when the shelf and the TCC-PTP card are locked.
HLDRV_CLOCK_CLAA	0..254	7	Clock class value sent in the Announce messages when the shelf is in holdover.
FREERUN_CLOCK_CLAA	0..254	52	Clock class value sent in the Announce messages at startup or if the PTP card as never been locked.

The Clock Quality configuration can be retrieved by the RTRV-EQPT-PTPC-PRIO command.

TL1 Syntax

```
RTRV-EQPT-PTPC-PRIO:[TID]:PTP-1-A..PTP-10-B:CTAG::REF=1..2;
```

Example

```
RTRV-EQPT-PTPC-PRIO:[TID]:PTP-1-A:MYCTAG::REF=1;
```

Answer:

```
   TEST 11-03-15 15-17-32
M  a COMPLD
   "PTPC-2-
A:REF=1,PRIO1=126,PRIO2=127,TRACKED_CLOCK_CLASS=6,HLDVR_CLOCK_C
LASS=7,FREERUN_CLOCK_CLASS=52;
```

6.9.6.3 TCC-PTP State

The status of the TCC-PTP is returned by the front panel LEDS, by TL1 answers to specific commands and by its active alarm list stored in the MAC card.

For a description of the front panel LEDs meaning see the physical layout chapter.

The TCC-PTP card state can be requested by the RTRV-EQPT-PTPC-STATE command.

TL1 Syntax

```
RTRV-EQPT-PTPC-STATE:[TID]:PTP-1-A..PTP-10-B:CTAG::PORT=1..2;
```

Example

```
RTRV-EQPT-PTPC-STATE::PTP-1-A:MYCTAG::PORT=1;
```

Answer:

```
   TEST 11-03-15 15-17-32
M  a COMPLD
   "PTPC-2-
A:PORT=1,STATE=MASTER,IS_TAI=TRUE,IS_LOCKED=TRUE,PTP_TIME=1300721333;
;
```

The input reference state can also be requested by the command RTRV-EQPT-PTPC-REF-STATE.

TL1 Syntax

```
RTRV-EQPT-PTPC-PRIO:[TID]:PTP-1-A..PTP-10-B:CTAG::REF=1..2;
```

Example

```
RTRV-EQPT-PTPC-PRIO:[TID]:PTP-1-A:MYCTAG::REF=1;
```

Answer:

```
Ex.:
   TEST 11-03-15 15-17-32
M  a COMPLD
   "PTPC-2-A:REF=1,IS_TAI=TRUE,CLOCK_CLASS=6,TIME_SOURCE=GPS;
```

6.9.6.4 TCC-PTP Statistics

Retrieves the PTP card PTP Fuzzy Lock, estimated phase error, frequency offset, Holdover Frequency Offset statistics.

TL1 Syntax

```
RTRV-EQPT-PTPC-STATS::PTP-1-A..PTP-10-B:ctag;
```

Example

```
RTRV-EQPT-PTPC-STATS::PTP-1-A:MYCTAG;
```

Answer:

```
   TEST 05-01-22 20-07-40
M  MYCTAG COMPLD
 "PTP-1-A:FUZZY_LOCK_TYPE=0.000000,
 FREQ_OUT_FREQ_OFFSET=0.000000,TIME_OUT_FREQ_OFFSET=0.000000,HLDVR_OF
FSET=0.000000,SUPPR_PHASE_JUMP=0.000000,
TIME_CORR_OUT_FREQ_OFFSET=0.000000"
;
```

6.9.6.5 Reference State

Retrieves the PTP card Reference Source State.

TL1 Syntax

```
RTRV-EQPT-PTPC-REF-STATE:[tid]:aid:ctag::REF=ref;
```

Example

```
RTRV-EQPT-PTPC-REF-STATE::PTP-1-A:MYCTAG::REF=1;
```

Answer:

```
 MY5548C 04-06-14 23:17:46
M MYCTAG COMPLD
 "PTP-1-A:REF=1,IS_TAI=FALSE,CLOCK_CLASS=21,TIME_SOURCE=GPS,
ACCURACY=100NS,LOG_VARIANCE=65535"
;
```

6.9.6.6 Grand Master Limits

In UNICAST mode the Grandmaster keeps track of the number of grants accorded to the slaves for each type of timing message and, as a consequence, the number of slaves currently served. User can also set two thresholds that are used to raise an alarm when the number of grants exceeds these limits.

TL1 Syntax

```
ED-EQPT-PTPC-
GMLIMITS:[tid]:aid:ctag::[MAX_SLAVE_NUM=max_slave_num],[SLAVE_N
UM_ALM_THRESHOLD=slave_num_alm_threshold];
```

Example

```
ED-EQPT-PTPC-GMLIMITS::PTP-1-
A:MYCTAG::MAX_SLAVE_NUM=128,SLAVE_NUM_ALM_THRESHOLD=120;
```

Parameter name	**Possible configurations**	**Default parameters**	**Description/Remarks**
AID	PTP-1-A ..PTP-10-B		Card position
MAX_SLAVE_NUM	0..128	128	Maximum number of supported slaves. Exceeding the value shall set the GM_SLAVE_NUM_EXCEEDED with severity CRITICAL
SLAVE_NUM_ALM_THRESHOLD	1..MAX_SLAVE_NUM	80	Shall be lower or equal to MAX_SLAVE_NUM. Exceeding the value shall set the GM_SLAVE_NUM_EXCEEDED with severity MAJOR. If the alarm is set and the number of slaves falls behind the threshold , the alarm is cleared.

The TL1 command RTRV-EQPT-PTPC-GMLIMITS can be used to retrieve the grant number and the threshold configuration.

Example

```
 MY5548C 04-06-14 23:17:46
M MYCTAG COMPLD
 "PTP-1-
A:PORT=1:MAX_SLAVE_NUM=128,SLAVE_NUM_ALM_THRESHOLD=120,ANNOUNCE
_GRANTS=20,SYNC_GRANTS =20,DELAY_GRANTS=20"
;
```

6.9.6.7 Compatibility with the G.8265.1 Profil

The G.8265.1 PTP profile foresees the mapping of SSM qualities into PTP clockClass specific values. User can enable or disable this mapping by using the command ED-EQPT-PTPC-G82651.

TL1 Syntax

```
ED-EQPT-PTPC-G82651:[tid]:aid:ctag::[PROFILE_ENABLE=profile_enable],[SSM_TO_CLOCKCLASS=ssm_to_clockclass];
```

Example

```
ED-EQPT-PTPC-G82651::PTP-1-A:MYCTAG::PROFILE_ENABLE=ENABLED,SSM_TO_CLOCKCLASS=DISABLED;
```

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
PROFILE_ENABLE	ENABLED/DISABLED	DISABLED	General flag for profile application
SSM_TO_CLOCKCLASS	ENABLED/DISABLED	DISABLED	According to G.8265.1 chapter 6.7.3.1)Mapping of SSM Quality Levels to PTP clock class)

The TL1 command RTRC-EQPT-PTPC-G82651 can be used to retrieve the G.8265.1 configuration settings.

SSM QL	G.781			PTP clockClass
	Option I	Option II	Option III	
0001		QL-PRS		80
0000		QL-STU	QL-UNK	82
0010	QL-PRC			84
0111		QL-ST2		86
0011				88
0100	QL-SSU-A	QL-TNC		90
0101				92
0110				94
1000	QL-SSU-B			96
1001				98
1101		QL-ST3E		100
1010		QL-ST3/ QL-EEC2		102
1011	QL-SEC/ QL-EEC1		QL-SEC	104
1100		QL-SMC		106
1110		QL-PROV		108
1111	QL-DNU	QL-DUS		110

Table 6-16 G.8265.1 SSM to PTP clockClass mapping

6.9.6.8 Ethernet Conection Status

The RTRV-EQPT-ETH-STATUS TL1 command can be used to retrieve information about the Ethernet connection.

TL1 Syntax

```
RTRV-EQPT-ETH-STATUS:[tid]:aid:ctag::PORT=port;
```

Example

```
RTRV-EQPT-ETH-STATUS::PTP-1-A:MYCTAG::PORT=1;
```

Output Example:

```
 MY5548C 04-06-14 23:17:46
M MYCTAG COMPLD
 "PTP_1-A:1:SFP_TYPE=OPTICAL,ETH_RATE=1000"
;
```

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
PORT	1..2	DISABLED	Ethernet port
SFP_TYPE	OPTICAL/ELECTRICAL/NONE	NONE	SFP connector type
ETH_RATE	10/100/1000	1000	Current Ethernet rate

6.9.6.9 VLAN configuration

User can configure the VLAN setting for the PTP port by using the ED-EQPT-PTPC-VLAN. Both tag and priority bit are configurable.

TL1 Syntax

```
ED-EQPT-PTPC-
VLAN:[tid]:aid:ctag::[MODE=mode],[TAG=tag],[PRIO=priority];
```

Example

```
ED-EQPT-PTPC-VLAN::PTP-1-
A:MYCTAG::MODE=ENABLED,TAG=1234,PRIO=7;
```

Parameter name	Possible configurations	Default parameters	Description/Remarks
AID	PTP-1-A ..PTP-10-B		Card position
MODE	ENABLED/DISABLED	DISABLED	Enables/disables the VLAN mode.
TAG	1..4095	1	VLAN Id. 4095 = Discard VLAN
PRIO	0..7	0	Priority bit according to 802.1q

The TL1 command RTRV-EQPT-PTPC-VLAN can be used to retrieve the VLAN configuration.

6.10 Synchronization Status Message - SSM

6.10.1 Introduction

In addition to the timing, E1 lines can carry Synchronization Status Messages (SSM) which is information about the timing quality level. The ITU-T G.781 Second Generation SSM norms define these messages.

The OSA 5548C SSU includes provisions for enhanced E1 interfaces with Synchronization Status Message detection and generation that:

- Select the best input line according to the SSM received
- Allow the operator to force a defined quality level on an input without a SSM capable signal
- Transmit the quality level received or defined on the 5548C's E1 (2.048 Mbit/s) outputs

Currently defined SSMs and quality levels are shown in the following table.

Quality Level	**Description**	**ITU-T Clock**	**SSM Code**
PRC	Primary Reference Clock	G.811 PRC	0010
SSU-A	Primary level SSU	G.812 Type I or V	0100
SSU-B	Second level SSU	G.812 Type VI	1000
SEC	SDH Equipment Clock	G.813 SDH Equipment Clock Option I	1011
DNU	Do Not Use	-	1111
FAILED	When a SSM code was previously received and suddenly not anymore	-	XXXX
UNKNOWN	SSM quality unknown. Any SSM code combinaison which is not listed in the column on the right	-	XXXX

Table 6-17 SSM & Quality Levels

6.10.2 SSM Configuration

In this section, it is explained how to set the OSA 5548C to work with SSM.

Note:

To retrieve current SSM quality supplied by the 5548C's E1 outputs, refer to refer to the **"TL1 Command List"** document.

6.10.2.1 Turn SSM On or Off

Using TL1

The following TL1 command will turn on the SSM function in the whole OSA 5548C SSU.

Input Syntax

```
SET-SSM:::ctag::ON;
```

To turn off the SSM, simply send this below command.

Input Syntax

```
SET-SSM:::ctag::OFF;
```

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *SSM* →

Then Select *SSM Enabled* or *SSM Disabled* according to your needs.

6.10.2.2 Input Line with SSM Quality Forced

When connecting an input which does not carry any SSM quality status, it is possible to force the SSM quality level in order to be transmitted through the OSA 5548C SSU.

Example:
In the application of a PRC frequency input line (i.e. 10MHz), which cannot carry SSM messages; it is possible to force SSM input quality level such as the "PRC".

Note:

Read section **Input connector to Input Line (IL) description 6.5** to understand the concept of cross connection of input lines to physical input port and to retrieve the current configuration.

Using TL1

The following command is required to check what the current status is. Many parameters will be returned, these pertinent instructions are highlighted in blue and boldface type, below:

Input Syntax

```
RTRV-EQPT-IL:aid:ctag;
```

Example:

```
RTRV-EQPT-IL:1-3:MYCTAG;
```

The response is formatted as shown below.

Output Syntax

```
      sid  date time
 M    ctag COMPLD

      "aid:opstate,ssm,INPUT=input,ADM_STATE=adm_state,
      TERM=term,CODE=code,WTR=wtr,FRCD=frcd,FREQ=freq,TAG=tag"
 ;
```

To force the SSM quality in the line, insert the SSM quality into the parameter "FRCD", the other ones are just necessary to configure correct frame and code to transmit the SSM.

Input Syntax

```
ED-EQPT-IL::aid:ctag::FRCD=frcd;
```

Example:

```
ED-EQPT-IL::1-2:MYCTAG::FRCD=SSU_A;
```

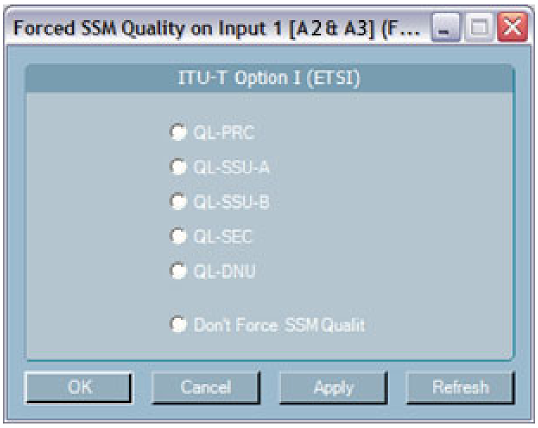
Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4, ALL*		This is the input line abbreviation. The first digit is the INC group number and the second digit is the input number (1-1/2/3/4).
SSM*	PRC, SSU_A , SSU_B, SEC, DNU, NONE, DISABLED	NONE	This is the input line SSM quality
FRCD	PRC, SSU_A , SSU_B, SEC, DNU, NONE	NONE	This is the forced SSM quality set for the corresponding line

- Not software configurable

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *Input 1…4 / GPS* → *Force SSM Quality*

Select the quality required to force on the specified Input.



6.10.2.3 GPS Line with SSM Quality Forced

The GPS card can generate a user-defined SSM quality for input selection in SSM mode. When the Forced mode is not enabled, the SSM quality supplied are the following:

- PRC when the GPS signal is tracked
- DNU when the GPS signal is not tracked

Using TL1

To retrieve the current GPS Properties, send the following command.

Input Syntax

```
RTRV-EQPT-GPS:::ctag;
```

Example:

```
RTRV-EQPT-GPS:::MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
 M    ctag  COMPLD

 "opstate,ssm:PPS_OFFSET=pps_offset,ADM_STATE=adm_state,
 INDOOR=indoor,ELEVATION=elevation,
 FRCD=frcd,VISIBLE=visible,TRACKED=tracked"
 ;
```

To edit all the parameters, send the following command.

Input Syntax

```
ED-EQPT-GPS:::ctag::FRCD=frcd;
```

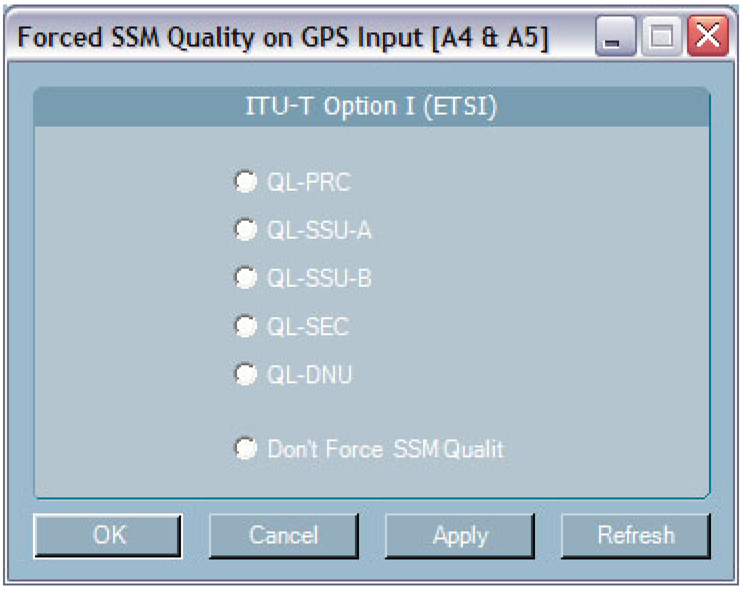
Example:

```
ED-EQPT-GPS:::MYCTAG::FRCD=PRC;
```

Parameter name	Possible configurations	Default parameters	Description
SSM	PRC, SSU_A, SSU_B, SEC, DNU, NONE, DISABLED	PRC when locked; DNU when unlocked	SSM quality supplied by the GPS group.
FRCD	PRC, SSU_A, SSU_B, SEC, DNU, NONE	NONE	Forced SSM quality

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → Inputs → *GPS Input* → *Force SSM Quality*



6.10.2.4 SSM Configuration

The OSA 5548C SSU allows editing of various parameters to configure the SSM operation.

Unknown (UNK) quality
The “Unknown” quality message (UNK) is the quality supplied when the system cannot recognize the SSM quality on inputs. The factory default SSM quality is “SEC”.

Forced (FRCD) quality
The OSA 5548C can be configured to force a SSM quality on its outputs.

Using TL1

To retrieve the current SSM configuration, the following command is required.

```
RTRV-SSM:::ctag;
```

Then you should be prompted as below.

```
       Sid   date  time
M      ctag  COMPLD
       "HLDVR=hdlvr,UNK=unk,FRCD=frcd"
;
```

To configure the SSM parameters, this command is required:

Input Syntax

```
ED-SSM:::ctag::[UNK=unk],[FRCD=frcd];
```

Example:

```
ED-SSM:::MYCTAG::UNK=DUS;
```

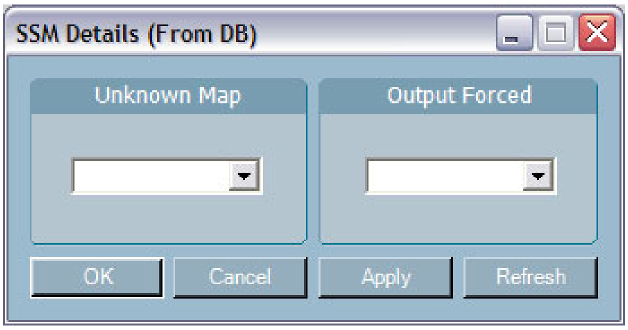
Parameter name	Possible configurations	Default Parameter	Description
HLDVR	SSU_A	SSU_A	This is the quality supplied when the THC runs in holdover. The 5548C always supply a SSU_A quality when it is running in holdover.
UNK	PRC, SSU_A , SSU_B, SEC, DNU, NONE	SEC	This is the value supplied when the system cannot recognize the SSM on the input
FRCD	PRC, SSU_A , SSU_B, SEC, DNU, NONE, DISABLED	NONE	This is the override quality level, and supersedes the input SSM level

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *SSM* → *Details*

Unknown Map
Select the SSM Quality to supply when the SSM on the specified is unknown.

Output Forced
Select the SSM Quality to force on all E1 output lines.



6.10.2.5 Sa bit Configuration on Input Lines

This section describes how to configure the Sa bit to receive SSM from the E1 input line (IL). The Sa bit selection depends to the E1 signal connected to the 5548C.

Note:

Read section **Input connector to Input Line (IL) description 6.5** to understand the concept of cross connection of input lines to physical input port and to retrieve the current configuration.

Note:

To configure the Sa bit in the E1 signal supplied by the 5548C, refer to section 6.9.4.1 and 0.

Using TL1

For retrieving current Sa bit configuration, send the following command.

Input Syntax

```
RTRV-EQPT-IL:aid:ctag;
```

Example:

```
RTRV-EQPT-IL:1-1:MYCTAG;
```

The response is formatted as below.

Output Syntax

```
      sid   date  time
M     ctag  COMPLD

      "aid:opstate,ssm,INPUT=input,ADM_STATE=adm_state,
      TERM=term,CODE=code,WTR=wtr,FRCD=frcd,
      OOF_DETECT=oof_detect,CRC4_DETECT=crc4_detect,
      BPV_DETECT=bpv_detect,SA4=sa4,SA5=sa5,SA6=sa6,SA7=sa7,
      SA8=sa8,FREQ=freq,TAG=tag"
;
```

To edit Sa configurations, the following command is required.

Input Syntax

```
ED-EQPT-IL::aid:ctag::SSM_BIT=ssm_bit;
```

Example:

```
ED-EQPT-IL::1-2:MYCTAG::SSM_BIT=SA4;
```

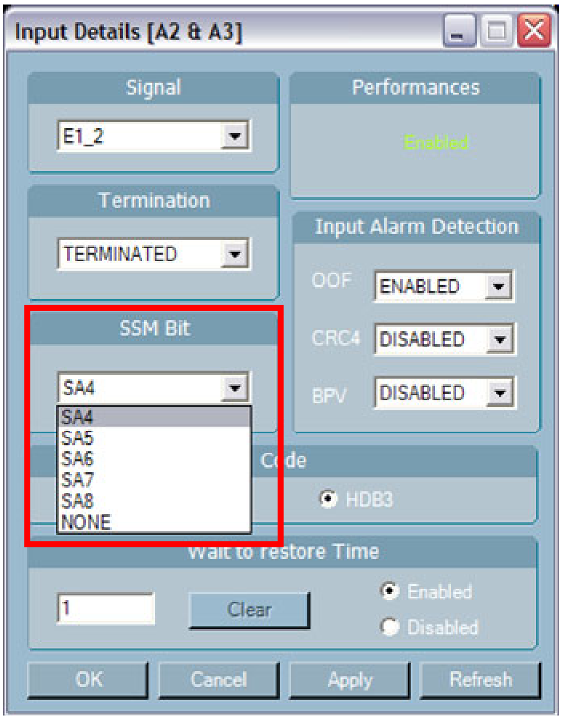
Parameter name	Possible configurations	Default parameters	Description
AID	1-1…1-4, ALL		This is the input line abbreviation. The first digit is the group number and the second digit is the input number (1-1/2/3/4).
SSM*	PRC, SSU_A , SSU_B, SEC, DNU, FAILED, NONE, DISABLED	NONE	This is the input line SSM quality
SA4*	OFF, ON, SSM		Value of the Sa4 bit
SA5*	OFF, ON, SSM		Value of the Sa5 bit
SA6*	OFF, ON, SSM		Value of the Sa6 bit
SA7*	OFF, ON, SSM		Value of the Sa7 bit
SA8*	OFF, ON, SSM		Value of the Sa8 bit
SSM_BIT	SA4, SA5, SA6, SA7, SA8, NONE	SA4	Sa bit used to transmit the SSM quality

***** Not configurable with software

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* → *Input 1…4* → *SSM Bit*

Select the Sa bit which carries the SSM according to your network requirements.



6.11 Alarms & Events

Alarms & events are transmitted independently by all the 5548C's cards to the MAC card, which gathers, manages them; keep the history log, manages the condition; shows the current active alarms & events. The 5548C can also escalate the alarm severity to a higher level after a configurable delay.

In addition to the alarms which can be shown by each card LEDs, physically, the MAC shows alarm severity level (Critical, Major, Minor) with the 3 pairs of LEDs on its front panel and on its output alarm relays, which are located on the Management connector tile and labeled ALARM OUT Group 1 and Group 2.

When receiving alarms through software, many details about each event and alarm are reported, as listed below.

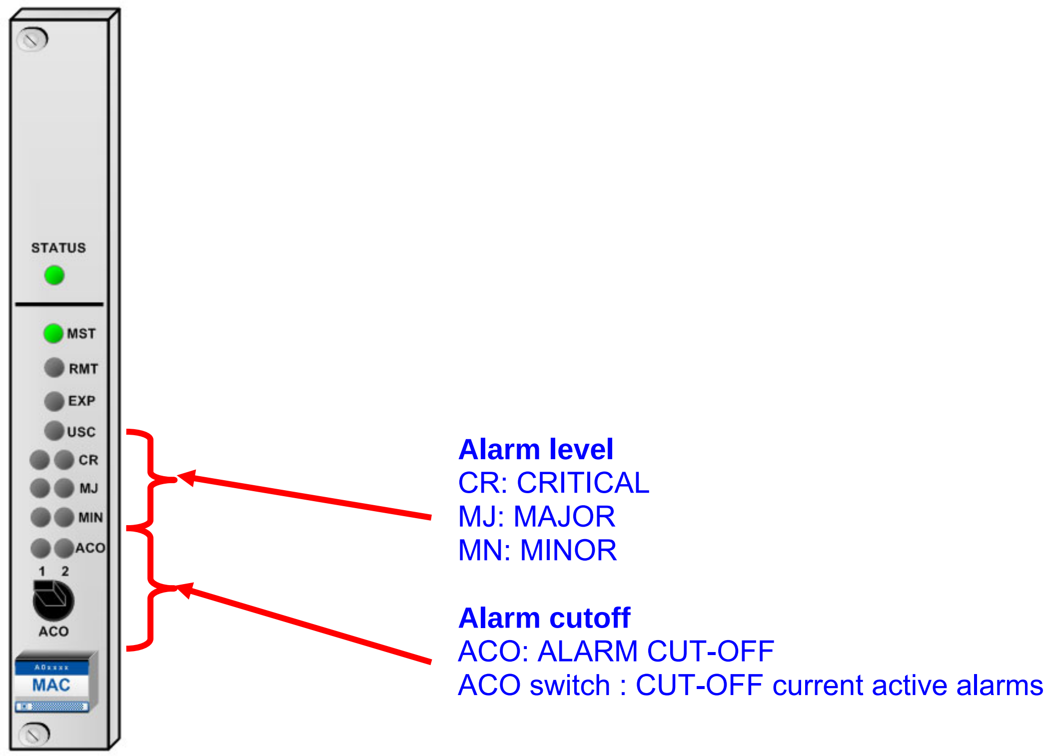
- Element in alarm
- Condition type and description
- Alarm description
- Transient events, a transient state of the card
- Alarm severity (Critical, Major, Minor)
- Alarm escalation
- If the service is affected or not
- If the alarm/event is stored in the history log (by default or by user configuration)

***Note*:**

For the complete list of all available alarms and events, please refer to **"Alarm List"** Document.

6.11.1 Buzzer, Alarm Cutoff (ACO) and MAC State

The MAC cards (slots A16) have various LEDs on their front panel. This section concentrates on Alarm levels and cutoff function



6.11.1.1 Retrieving MAC Configuration and State

To retrieve the current MAC configuration and status, the following command is required.

<u>Input Syntax</u>

```
RTRV-EQPT-MAC:::ctag;
```

The response is formatted as below.

<u>Output Syntax</u>

```
        sid   date  time
M       ctag  COMPLD
        "opstate:BUZZER=buzzer,ALMESC=almesc,ACO=aco,
        SYS_MODE=sys_mode,[EXP_NR=exp_nr]"
;
```

Parameter name	Possible configurations	Default parameters	Description
OPSTATE	OK, ALARM, DEGRADED, TESTERROR	OK	There are nine different MAC group states: **OK**: The card is running correctly **ALARM**: The card is in alarm **DEGRADED**: The firmware version is not the same as the rest of the shelf **TESTERROR**: Invalid testing date
BUZZER	OFF, CR, MJ, MN	MJ	This parameter is the level to trigger the MAC Card buzzer sound.
ACO	1, 2, BOTH, NONE	1	This is the parameter to choose for applying the cutoff on the range 1, 2, both ranges or none
ALMESC	0, 6…48	24	This is the delay in hour after which a severity of an active alarm is escalated to an higher level. 0 means no escalation.
SYS_MODE	INV, MST, EXP	MST	System mode INV: INVALID MST: MASTER EXP: EXPANSION
EXP_NR	1…4		When the system is an EXPANSION shelf, this parameter returns the expansion number

6.11.1.2 Editing Buzzer sound

There are different types of alarm conditions, these levels are CR (CRITICAL), MJ (MAJOR) and MN (MINOR).

The MAC card can make a sound using its on-board buzzer on any of these 3 alarm severities when an alarm occurs to user defined levels, listed below:

- OFF: buzzer not activated
- CR: buzzer audibly sound on critical alarms only
- MJ: buzzer audibly sound on major and critical alarms
- MN: buzzer audibly sound on minor, major and critical alarms

***Note*:**

Retrieve current configuration in section 6.11.1.1

Using TL1

To edit the alarm level to make a sound, the following TL1 command is required.

Input Syntax

`ED-EQPT-MAC:::ctag::BUZZER=buzzer;`

Example:

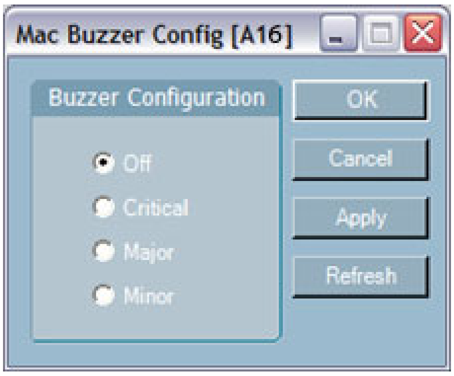
`ED-EQPT-MAC:::MYCTAG::BUZZER=CR;`

Parameter name	Possible configurations	Default parameters	Description
BUZZER	OFF, CR, MJ, MN	MJ	This parameter is the level on which you want the MAC card making a sound

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *MAC* → *Buzzer*

Select Alarm criteria required to make a sound.



6.11.1.3 Editing Alarm CutOff (ACO)

ACO is provided to suppress any audible office row alarms, to allow operators to suppress alarms bells while the alarm is being addressed. Subsequent alarms should reset the ACO latch operation. The 5548C ACO operation is fully programmable on one or both of two groups. Pressing ACO does not clear the alarm cause or condition. Internal buzzer and relay output are disabled when ACO is activated.

To physically cutoff alarms

To extinguish any alarm LED, press the switch labeled ACO, which is located on the bottom of the MAC. Except any specific configuration as per shown in the next section, deactivating an alarm turns off the three CR, MJ and MN LEDs. However, the MAC cards continue to report the alarm message until the original alarm condition is cleared.

To cutoff alarms using software

Using TL1

The following TL1 command remotely performs the same function as pressing the ACO switch physically on the MAC card.

Input Syntax

```
OPR-ACO-ALL:::ctag;
```

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *MAC* → *Set Alarm Cutoff*

Cutoff alarm configuration

Note:

Retrieve current configuration in section 6.11.1.1

On the MAC card's front panel there are two colomns of Alarm level LEDs labeled 1 & 2. It is possible to cutoff the LEDs on first, second, both ranges, or disabling the ACO (none). For that purpose, the following TL1 command is required.

Input Syntax

```
ED-EQPT-MAC:::ctag::ACO=aco;
```

Example:

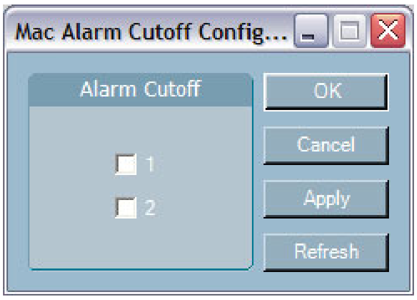
```
ED-EQPT-MAC:::MYCTAG::ACO=2;
```

Parameter name	Possible configurations	Default parameters	Description
ACO	1, 2, BOTH, NONE	1	This is the parameter to choose for applying the cutoff on the range 1, 2 both ranges or none

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *MAC* → *Alarm Cutoff*

Select the colomn 1, 2 or both.



6.11.1.4 Alarm Escalation

The OSA 5548C SSU has the capability to escalate the severity of an active alarm to a higher level after a defined time (24 hours by default).

Example:

After a delay of 24 hours an active alarm with a Minor (MN) severity will escalate to a Major (MJ) severity.

***Note*:**

Retrieve current configuration in section 6.11.1.1

Using TL1

To modify the escalation delay, the following command is required.

Input Syntax

```
ED-EQPT-MAC:::ctag::ALMESC=almesc;
```

Example:

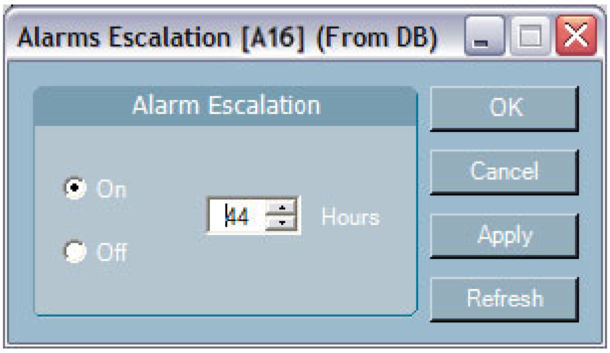
```
ED-EQPT-MAC:::MYCTAG::ALMESC=48;
```

Parameter name	Possible configurations	Default parameters	Description
ALMESC	0, 6…48	24	This is the delay in hour after which a severity of an active alarm is escalated to a higher level. 0 means no escalation.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *MAC* → *Alarm escalation*

Set "ON" to enable the alar escalation function and then configure a time between 6 and 48 hous.



6.11.2 Retrieving Current Active Alarms with Software

This section explains how to retrieve current active Alarms Reported by the shelf and the syntax.

***Note*:**

For retrieving all the alarms and events, refer to section 6.11.4

There are many parameters in response of the TL1 command to retrieve the active alarms, which are described below:

- **Element on which the alarm status is requested (AID)**
  The Cards Group's current active alarms, as well as alarms from the entire shelf.
- **Notification Code (NTFCNCDE)**
  This is the alarm severity associated to the alarm (Critical, Major, Minor or Non-Alarmed).
- **Condition Type (CONDTYPE)**
  This is the type of the alarm condition, which is written as an alarm abbreviation, i.e. LOS for Loss Of Signal.
- **Service Effect (SRVEFF)**
  This parameter reports whether the service is affected (SA) or not (NSA).
- **Location (LOCN)**
  This parameter indicates the location of alarm. If the alarm concerns the card itself, the response is called "NEAR END" (NEND) and if the alarm occurs on a distant device that is connected to the card, it is called "FAR END" (FEND).
- **Direction (DIRN)**
  This is the direction of the alarm condition, which can be Transmitted (TRMT), Received (RCV), Both Transmitted and Received (BTH) or Non Applicable (NA).
- **Time period (TMPER)**
  Accumulation time period for Performance Measurement parameters.

- **Occurrence Date (OCRDATE)**
  This is the date when the event/alarm occurred.
- **Occurrence Time (OCRTM)**
  This is the time when the event/alarm occurred.
- **Condition Description (CONDESCR)**
  This parameter describes the alarm condition in up to 64 characters.
- **Detailed information of the element (AIDET)**
  Detailed and supplementary information of the card or element of details of the current alarm, to identify the location of the reported trouble.
- **Observed Behavior (OBSDBHVR)**
  This concerns the behavior observed resulting from the trouble reported by this alarm. It is limited to 512 characters.
- **Expected Behavior (EXPTBHVR)**
  This concerns the behavior expected. Its deviation is described in the observed behavior that resulted in this reported trouble. It is limited to 512 characters.
- **Diagnostic Type (DGNTYPE)**
  Type of the diagnostic routine used to isolate the trouble.
- **Trouble Isolation (TBISLT)**
  Significance of the isolation information provided by the card or element in question included in this message.

Using TL1

The following TL1 command is required to retrieve the current active alarms.

Input Syntax

```
RTRV-ALM::aid:ctag;
```

Example:

```
RTRV-ALM::THC:MYCTAG;
```

The response is formatted as below.

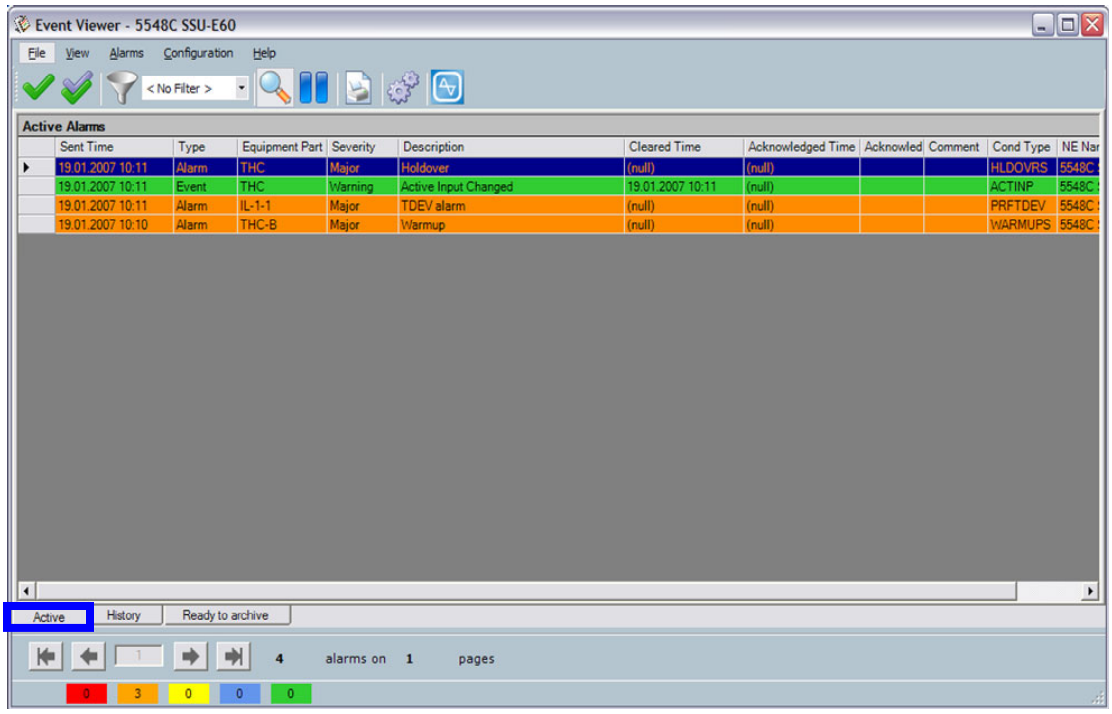
Output Syntax

```
       sid   date  time
M      ctag  COMPLD

 "aid:ntfcncde,condtype,srveff,[ocrdat],[ocrtm],[locn],[dirn],[
tmper]:[conddescr],[aiddet],[obsdbhvr],[exptdbhvr]:[dgntype],[t
blislt]"
;
```

Parameter name	Possible configurations	Default parameters	Description
AID	INC-1, INC, GPS,THC, SGC, OUC-1..OUC-10, OUC, MAC, ALL		Cards from which the active alarms are requested
NTFCNCDE	CR, MJ, MN, NA	NULL	Notification code associated with the alarm conditions being retrieved.
CONDTYPE	CONDTYPE	NULL	Type of alarm condition.
SRVEFF	SA, NSA	NULL	Effect on service caused by the alarm. SA: Service Affecting; NSA: on Service Affecting.
OCRDAT*	2004-01-01..2099-12-31	NULL	Date when the triggering event occurred.
OCRTM*	00-00-00..23-59-59	NULL	Time when the triggering event occurred.
LOCN	NEND, FEND	NULL	Single location for which an alarm condition is reported.
DIRN	TRMT, RCV, BTH, NA	NULL	Direction of the alarm condition, relative to the identified entity.
TMPER		NULL	Accumulation time period for PM (Performance Measurement) parameters.
CONDDESCR*	\"CONDDESCR\"	NULL	Detailed text description of the trouble. Limited to 64 characters enclosed within escaped quotes.
AIDDET*		NULL	Supplementary equipment identification used to identify the location of the reported.
OBSDBHVR*		NULL	Observed behavior that resulted in this reported trouble. Limited to 512 characters enclosed within escaped quotes.
EXPTDBHVR*		NULL	Expected behavior whose deviation is described in observed behavior that resulted in this reported trouble. Limited to 512 characters enclosed within escaped quotes.
DGNTYPE*		NULL	Type of diagnostic routine used to isolate the trouble.
TBLISLT*		NULL	Significance of the isolation information provided by the card or element in question included in this message.

*: Not software configurable

Using SyncView



Open the *Event Viewer* and look at the *Active* tab

Note:

Refer to the SyncView manual for EventViewer description and use.

6.11.3 Alarm Condition

This section explains how to retrieve alarm conditions, which means all alarms and events reported by the shelf and their syntax.

The parameters in the response of the TL1 command to retrieve the active alarms are the following:

- **Element on which the alarm status is requested (AID)**
  The Cards Group's current active alarms and events, as well as alarms and events from the entire shelf.
- **Condition Type (CONDTYPE)**
  This is the type of the alarm condition, which is written as an alarm abbreviation, i.e. LOS for Loss Of Signal.
- **Location (LOCN)**
  This parameter indicates the location of alarm. If the alarm concerns the card itself, the response is called "NEAR END" (NEND) and if the alarm occurs on a distant device that is connected to the card, it is called "FAR END" (FEND).
- **Direction (DIRN)**
  This is the direction of the alarm condition, which can be Transmitted (TRMT), Received (RCV), Both Transmitted and Received (BTH) or Non Applicable (NA).
- **Time period (TMPER)**
  Accumulation time period for Performances Measurement parameters.
- **Notification Code (NTFCNCDE)**
  This is the alarm severity associated to the alarm (Critical, Major, Minor or Non Applicable).
- **Service Effect (SRVEFF)**
  This parameter inform if the service is affected (SA) or not (NSA).
- **Occurrence Date (OCRDATE)**
  This is the date when the event/alarm occurred.
- **Occurrence Time (OCRTM)**
  This is the time when the event/alarm occurred.
- **Condition Description (CONDESCR)**
  This parameter describes the alarm condition

Input Syntax

```
RTRV-COND::aid:ctag::[condtype],[locn],[dirn];
```

Example:

```
RTRV-COND::OUC-2:MYCTAG::,,;
```

The response is formatted as below.

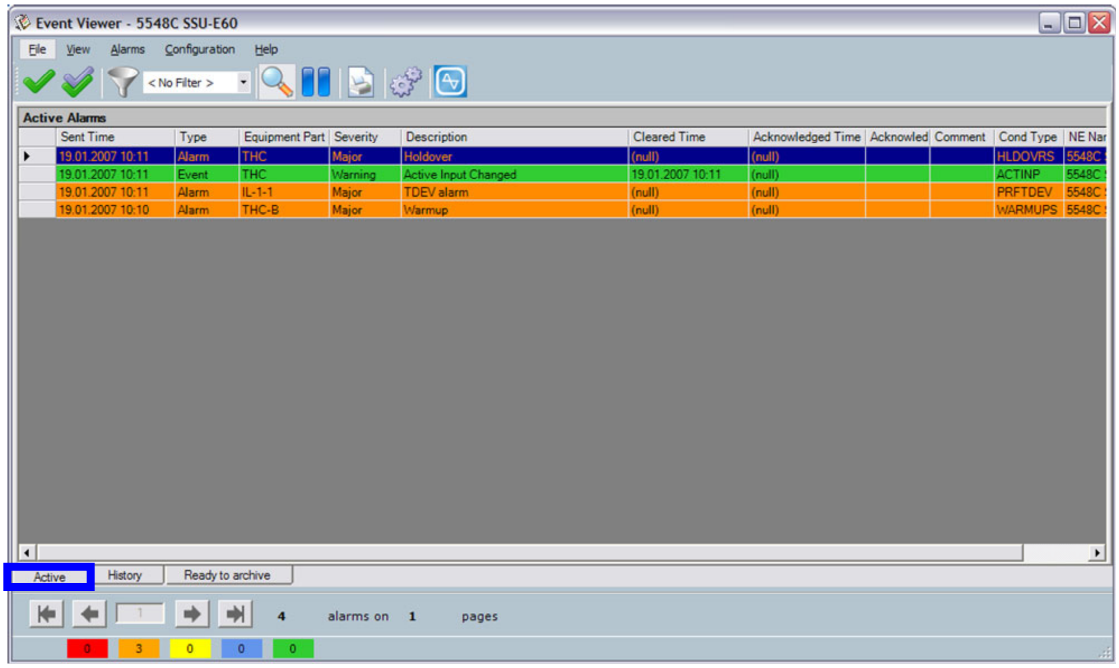
Output Syntax

```
        sid   date  time
M       ctag  COMPLD

 "aid:[ntfcncde],condtype,[srveff],[ocrdat],[ocrtm],[locn],[dir
n],[tmper],[conddescr]";
```

Parameter name	Possible configurations	Default parameters	Description
AID	INC-1, INC, GPS, THC, SGC, OUC-1..OUC-3, OUC, MAC, ALL		Cards from which the alarms conditions are requested
NTFCNCDE	CR, MJ, MN, NA	NULL	Notification code associated with the alarm conditions being retrieved.
CONDTYPE	CONDTYPE	NULL	Type of alarm condition.
LOCN	NEND, FEND	NULL	Single location for which an alarm condition is reported.
DIRN	TRMT, RCV, BTH, NA	NULL	Direction of the alarm condition, relative to the identified entity.
TMPER		NULL	Accumulation time period for PM (Performance Measurement) parameters.
SRVEFF*	SA, NSA	NULL	Effect on service caused by the alarm. SA: Service Affecting; NSA: on Service Affecting.
OCRDAT*	2004-01-01..2099-12-31	NULL	Date when the triggering event occurred.
OCRTM*	00-00-00..23-59-59	NULL	Time when the triggering event occurred.
CONDDESCR*	\"CONDDESCR\"	NULL	Detailed text description of the trouble. Limited to 64 characters enclosed within escaped quotes.

*: Not software configurable

Using SyncView



Open the *Event Viewer* and look at the *Active* tab

***Note*:**

Refer to the SyncView manual for EventViewer description and use.

6.11.4 Alarm History

6.11.4.1 Overview

The OSA 5548C SSU can keep up to 256 alarms & events in its memory for history log purposes. Once the memory has reached this number of items, it overwrites the old ones to store the new ones, as a FIFO (First alarm IN – First alarm OUT) system.

Should a greater number of historical alarms be required, SyncView PLUS software is recommended, which stores an unlimited number of alarms and events.

6.11.4.2 Retrieving the Alarm History

The parameters in the response of the TL1 command to retrieve the active alarms are the following:

- **Element on which the alarm status is requested (AID)**
  The Cards Group's historic of alarms and events, as well as historic of alarms and events from the entire shelf.
- **Notification Code (NTFCNCDE)**
  This is the alarm severity associated to the alarm (Critical, Major, Minor or Non Applicable).
- **Condition Type (CONDTYPE)**
  This is the type of the alarm condition, which is written as an alarm abbreviation, i.e. LOS for Loss Of Signal.
- **Service Effect (SRVEFF)**
  This parameter inform if the service is affected (SA) or not (NSA).
- **Automatic message TAG (ATAG)**
  Unique identifier of the set message. It is an integer number called Autonomous message TAG (ATAG).
- **Occurrence Date (OCRDATE)**
  This is the date when the event/alarm occurred.
- **Occurrence Time (OCRTM)**
  This is the time when the event/alarm occurred.
- **ATAG for the Cleared Alarm (CLRATAG)**
  Once the alarm cleared, the 5548C generates a unique identifier number called the Autonomous message TAG (ATAG).
- **Date of the Cleared Alarm (CLRDAT)**
  This is the date when the alarm has been cleared.
- **Time of the Cleared Alarm (CLRTM)**
  This is the time when the alarm has been cleared.
- **Condition Description (CONDESCR)**
  This parameter describes the alarm condition.

Using TL1

Input Syntax

```
RTRV-ALM-HIST:::ctag::[ntfcncde],[condtype],[srveff];
```

Example

```
RTRV-ALM-HIST:::MYCTAG::MJ,,NSA;
```

The response is formatted such as below.

Output Syntax

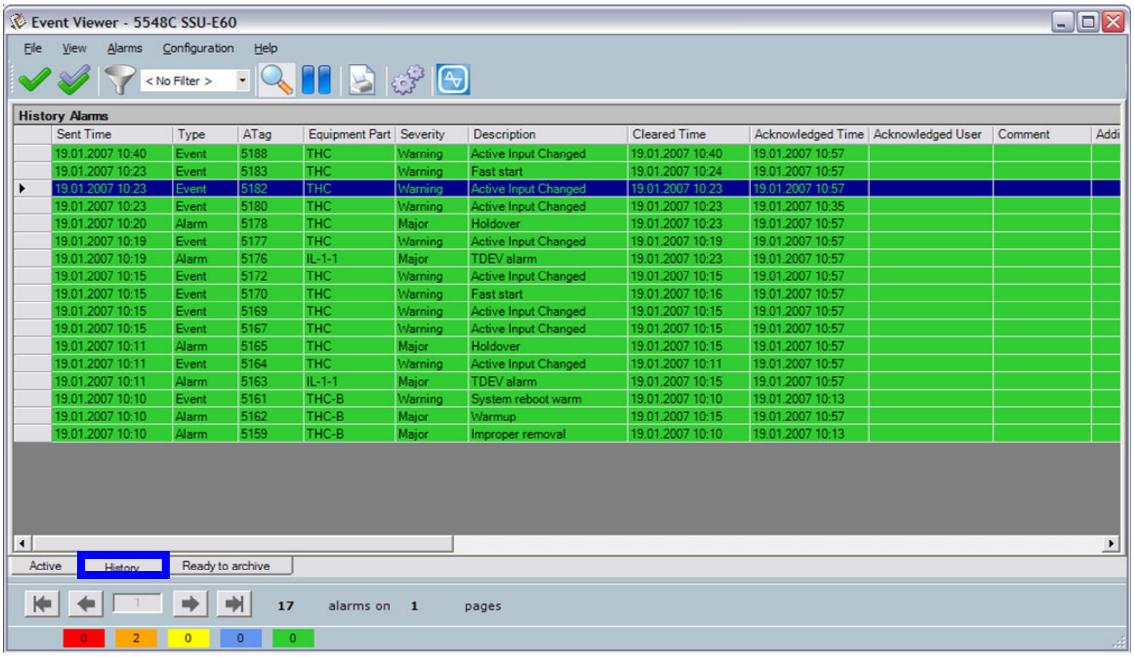
```
        sid   date  time
M       ctag  COMPLD

 "aid:atag,ntfcncde,condtype,srveff,ocrdat,ocrtm,[clratag],
[clrdat],[clrtm]:[conddescr]";
```

Parameter name	Possible configurations	Default parameters	Description
AID	INC-1, INC, GPS, THC, SGC, OUC-1..OUC-10, OUC, MAC, ALL		Cards needed to request the active alarms
NTFCNCDE	CR, MJ, MN, NA	NULL	Notification code associated with the alarm conditions being retrieved.
CONDTYPE	CONDTYPE	NULL	Type of alarm condition.
SRVEFF	SA, NSA	NULL	Effect on service caused by the alarm
LOCN*	NEND, FEND	NULL	Single location for which an alarm condition is reported.
DIRN*	TRMT, RCV, BTH, NA	NULL	Direction of the alarm condition, relative to the identified entity.
TMPER*		NULL	Accumulation time period for PM (Performance Measurement) parameters.
OCRDAT*	2004-01-01..2099-12-31	NULL	Date when the triggering event occurred.
OCRTM*	00-00-00..23-59-59	NULL	Time when the triggering event occurred.
CLRTAG*	0…65535	NULL	ATAG of the clear message
CLRDAT*	2004-01-01..2099-12-31	NULL	Date when the triggering event has been cleared.
CLRTM*	00-00-00..23-59-59	NULL	Time when the triggering event has been cleared.
CONDDESCR*	\"CONDDESCR\"	NULL	Detailed text description of the trouble. Limited to 64 characters enclosed within escaped quotes.

*: Not software configurable with the command RTRV-ALM-HIST

Using SyncView

Open the *Event Viewer* and look at the *History* tab. For the occurrences, which have not been acknowledged yet, they are shown on the *Active* Window.



> ***Note*:**
>
> Refer to the SyncView manual for EventViewer description and use.

6.11.4.3 Erasing the Alarm History

Should it is needed to clear the complete alarm & event history stored in the OSA 5548C, the following TL1 command is required.

<u>Input Syntax</u>

```
INIT-ALM-HIST:::ctag;
```

6.11.5 Autonomous Messages

6.11.5.1 Message Types

An autonomous message is information spontaneously sent by the OSA 5548C SSU when something happens in the system. The following types of autonomous messages are available:

- **Alarm message (ALM)**
  Message sent as soon as an alarm is detected in the shelf
- **Event message (EVT)**
  Message sent as soon as an event is detected in the shelf
- **Performance message (PM)**
  This message reports the performances being measured.
- **Switching message (SW)**
  This message is reported when an active card (typically card A) has switched to a standby card, i.e. INC-1-A to INC-1-B.

6.11.5.2 Alarm Code Parameters in Autonomous Alarm Messages (almcde)

When receiving automatic alarm messages, a couple of characters are written at the beginning of the message, this is called “almcde”.

Example of autonomous alarm message:

```
   MAC-ACK 118-29-01 00-36-43
** 2784 REPT ALM
   "SGC:MJ,EQPT,SA,2005-29-01,00-36-43,,NA:\"Output failure\""
;
```

Alarm code	Description	Abbreviation
*C	Critical Alarm condition	CR
**	Major Alarm condition	MJ
*	Minor Alarm condition	MN
A	Non-alarmed or cleared autonomous message.	CL or NA

6.11.5.3 Message Format

Given the message type definitions previously explained, this is an example of message format:

Output Syntax

```
       sid   date  time
almcde ctag  REPT  rept
 "[message]"
;
```

Possible configurations for **rept**	Description
ALM	Alarm message
EVT	Event message
PM	Performance Measurement message
SW	Switching card message

***Note*:**

To understand the **message** given in the autonomous message, read the next chapters accordingly.

6.11.5.4 Message encapsulated in Alarm (ALM) report

This message is spontaneously reported by the OSA 5548C SSU when an alarm occurs.

Output Syntax

```
       sid   date  time
almcde ctag  REPT  ALM

"aid:ntfcncde,condtype,srveff,[ocrdat],[ocrtm],[locn],[dirn],[t
mper]:[conddescr],[aiddet],[obsdbhvr],[exptdbhvr]:[dgntype],[tb
lislt]"
;
```

Parameter name	Possible configurations	Default parameters	Description
AID	INC-1, INC, GPS, THC, SGC, OUC-1..3, OUC, MAC, ALL		Card related to the alarm report
NTFCNCDE	CR, MJ, MN, NA	NULL	Notification code associated with the alarm conditions being retrieved.
CONDTYPE	CONDTYPE	NULL	Type of alarm condition.
SRVEFF	SA, NSA	NULL	Effect on service caused by the alarm
LOCN	NEND, FEND	NULL	Single location for which an alarm
DIRN	TRMT, RCV, BTH, NA	NULL	Direction of the alarm condition, relative to the identified entity.
TMPER		NULL	Accumulation time period for PM (Performance Measurement) parameters.
OCRDAT	2004-01-01..2099-12-31	NULL	Date when the triggering event occurred.
OCRTM	00-00-00..23-59-59	NULL	Time when the triggering event occurred.
CONDDESCR	\"CONDDESCR\"	NULL	Detailed text description of the trouble. Limited to 64 characters enclosed within escaped quotes.
AIDDET		NULL	Supplementary equipment identification used to identify the location of the reported.
OBSDBHVR		NULL	Observed behavior that resulted in this reported trouble. Limited to 512 characters enclosed within escaped quotes.
EXPTDBHVR		NULL	Expected behavior whose deviation is described in observed behavior that resulted in this reported trouble. Limited to 512 characters enclosed within escaped quotes.
DGNTYPE		NULL	Type of diagnostic routine used to isolate the trouble.
TBLISLT		NULL	Significance of the isolation information provided by the card or element in question included in this message.

6.11.5.5 Message Encapsulated in Event (EVT) Report

This message is spontaneously reported by the OSA 5548C SSU when an event occurs.

Output Syntax

```
       sid  date time
almcde ctag REPT EVT

"aid:[ntfcncde],condtype,[srveff],[ocrdat],[ocrtm],[locn],[dirn
],[tmper]"
;
```

Parameter name	Possible configurations	Default parameters	Description
AID	INC-1, INC, GPS, THC, SGC, OUC-1..OUC-3, OUC, MAC, ALL		Cards related to the event report
NTFCNCDE	CR, MJ, MN, NA	NULL	Notification code associated with the event conditions being retrieved.
CONDTYPE	CONDTYPE	NULL	Type of event condition.
SRVEFF	SA, NSA	NULL	Effect on service caused by the event
LOCN	NEND, FEND	NULL	Single location for which an alarm
DIRN	TRMT, RCV, BTH, NA	NULL	Direction of the alarm condition, relative to the identified entity.
OCRDAT	2004-01-01..2099-12-31	NULL	Date when the triggering event occurred.
OCRTM	00-00-00..23-59-59	NULL	Time when the triggering event occurred.
TMPER		NULL	Accumulation time period for PM (Performance Measurement) parameters.

6.11.5.6 Message Encapsulated in Switching (SW) Report

This message is spontaneously reported by the OSA 5548C SSU when two cards from the same group have swapped, i.e. THC-A becomes in stand-by and THC-B becomes active.

Output Syntax

```
       sid  date time
almcde ctag REPT SW
 “actid,stbyid”
;
```

Parameter name	Possible configurations	Description
ACTID	INC-1-A…INC-1-B, ,GPS-A, GPS-B,THC-A, THC-B, SGC-A, SGC-B, MAC-A, MAC-B	This is the card which was in Stand-by and now has became as Active
STBYID	INC-1-A…INC-1-B, ,GPS-A, GPS-B,THC-A, THC-B, SGC-A, SGC-B, MAC-A, MAC-B	This is the card which was Active and now has became in Stand-by

6.11.5.7 Message Encapsulated in Database Change (DBCHG) Report

This function is not implemented yet.

6.11.5.8 Message Encapsulated in Performance Measurement (PM) Report

Refer to section 6.12

6.11.5.9 Retrieving all Autonomous Messages

To retrieve a list of queued autonomous messages or a missing one, use the following TL1 command.

Input Syntax

```
RTRV-AO:::ctag::[ATAGSEQ=atagseq],[MSGTYPE=msgtype],
[DBCHGSEQ=dbchgseq];
```

Example:

```
RTRV-AO:::MYCTAG::MSGTYPE=PM;
```

Output Syntax

```
       sid  date time
M      ctag COMPLD
       /* message */
;
```

Parameter name	Possible configurations	Default parameters	Description
ATAGSEQ	1…9999		This is the ATAG of the autonomous message to be retrieved. Multiple or range values can be specified by using "&" or "&&" notation. This message can be used together with the MSGTYPE parameter. It is not usable if DBCHSEQ is configured
MSGTYPE	ALM, EVT, PM	NULL	Type of message to be retrieved
DBCHSEQ	1…99999	NULL	Sequence number of DBCHG (Database Change) messages.
MESSAGE*	SA, NSA	NULL	This is the autonomous message

6.11.5.10 Deleting Autonomous Messages

It is possible to clear the entire automatic message log or any specified autonomous message contained in the log.

The following command is required.

Input Syntax

```
INIT-AO::aid:ctag;
```

Example:

```
INIT-AO::ALM:MYCTAG;
```

Parameter name	Possible configurations	Description
AID	ALM, EVT, PM, DBCHG, SW, ALL	This is the type of autonomous message that you want to clear. ALM: Alarm EVT: Events PM: Performance Measurement DBCHG: Database Change SW: Switching

6.12 Performance Measurement (PM)

6.12.1 Overview

6.12.1.1 Introduction

The OSA 5548C SSU is able to make performance measurements of signals fed into its input and therefore provides information about the signal quality.

The measurement system is embedded in the INC cards, which compare the input signal against a reliable frequency reference produced by the signal filtered and processed by the active THC card.

The user can also define a performance threshold to disqualify and reject input signals that fail to meet this programmable threshold.

The OSA 5548C SSU measures and calculates performances in Ym (fractional frequency), TDEV (Time DEViation) and MTIE (Maximum Time Interval Error).

6.12.1.2 Requirement

The performance measurements can be performed when the input line to be measured meets one of the following criteria:

- **Enabled:** the line is activated to select an input reference.
- **Monitored:** the input line is not enabled, nor disabled, just monitored in order to assess (measure) the signal.

The Performance Measurement must be enabled and should not be in alarm or disabled.

One of the input references must be enabled and selected (qualified) by the OSA 5548C SSU. This active input is used as the Performance Measurement reference, once it has been processed by THC filtering

Note:

One of the input references must be enabled and selected (qualified) by the OSA 5548C SSU. This active input is used as the Performance Measurement reference, once it has been processed by THC filtering.

6.12.1.3 Operation

The OSA 5548C SSU performs the input signal measurement every second within a period of 3 hours, to create a performance measurement set. The OSA 5548C can store up to 8 sets of measurements over 24 hours. To store and display more measurement results (sets), we recommend *SyncView PLUS* remote management software.

Characteristics	Description	Value
PM resolution	Resolution of the measurement (the smallest unit measured)	1 ns
Sampling rate	This is the rate of the measurement sampling. So, each second the system measures the input signal quality	1 s
Duration of an interval for the calculation & measurement of a PM set	The duration of a PM set. As soon as an input reference is detected as good (OK), the measurement process starts for 3 hours, thereafter; it restarts a new set, and so on until that an alarm or a PM deactivation is detected.	3 h

6.12.2 Turn-on/off and resetting PM

6.12.2.1 Turn ON or OFF the PM

Using TL1

To turn on the performance measurement function, the following TL1 command is required.

Input Syntax

```
SET-PM:::ctag::pmon;
```

Example:

```
SET-PM:::MYCTAG::ON;
```

Parameter name	Possible configurations	Default parameters	Description
PMON	ON, OFF	ON	ON to activate the Performance Measurement process and OFF to disable it.

Using SyncView

Open the *Physical* or *Logical View* → *Elements* → *Inputs* →

Then select *Perf Enabled* or *Perf Disabled*

6.12.2.2 Initializing PM

***Note*:**

As long as a PM set (3 hours of measurement) is not terminated, it can be reset.

To reset all the on-going performance measurements (on all the input lines), the user can turn off the PM process and then turn-on to restart a new one.

To reset the on-going PM set on a specific input line, the following TL1 command is required.

Input Syntax

```
INIT-PM::aid:ctag;
```

Example:

```
INIT-PM::IL-2-1:MYCTAG;
```

Parameter name	Possible configurations	Default parameters	Description
AID	IL-1-1…IL-1-4, GPS		This parameter is the input line to be reset.

6.12.3 Delays to Retrieve the 1st Result and Time Intervals for Updates

There is no need to wait 3 hours to get a measurement result or a measurement update once the first result has been received. The first measurements can be seen after the time specified in the tables below and then, each time interval written in the column on the right of the below MTIE and TDEV tables.

6.12.3.1 Delays and Intervals to Retrieve MTIE PM Results

PM observation time	Delay to get the first PM result	Time interval to get a new PM update after the 1st measurement
MTIE-1S	900s (15min)	900s (15min)
MTIE-1M	900s (15min)	900s (15min)
MTIE-15M	900s (15min)	900s (15min)
MTIE-30M	1800s (30min)	900s (15min)
MTIE-1H	3600s (1h)	900s (15min)
MTIE-3H	10800s (3h)	No update as it is the latest value of the time interval

Table 6-18 Delays and Intervals to Retrieve MTIE PM Results

6.12.3.2 Delays and Intervals to Retrieve TDEV PM Results

PM observation time	Delay to get the first PM result	Time interval to get a new PM update after the 1st measurement
TDEV-1S	900s (15min)	900s (15min)
TDEV-4S	900s (15min)	900s (15min)
TDEV-16S	900s (15min)	900s (15min)
TDEV-64S	1800s (30min)	900s (15min)
TDEV-256S	3600s (1h)	900s (15min)
TDEV-1000S	10800s (3h)	No update as it is the latest value of the time interval

Table 6-19 Delays and Intervals to Retrieve TDEV PM Results

6.12.3.3 Delays to Retrieve Ym PM results

PM observation time	Delay to get the PM result
Ym-60S	60s (1min)
Ym-540S	540s (9min)
Ym-15M	900s (15min)
Ym-1H	3600s (1h)
Ym-2H	7200s (2h)
Ym-3H	10800s (3h)

Table 6-20 Delays to Retrieve Ym PM Results

6.12.4 Retrieving PM Results

For retrieving the current measurement results or one of the 8 previous ones stored in the OSA 5548C SSU, the following command is required.

Using TL1

Input Syntax

```
RTRV-PM::aid:ctag::kind,[set];
```

Example:

```
RTRV-PM::IL-1-2:MYCTAG::MTIE,2;
```

The response is formatted as below.

Output Syntax

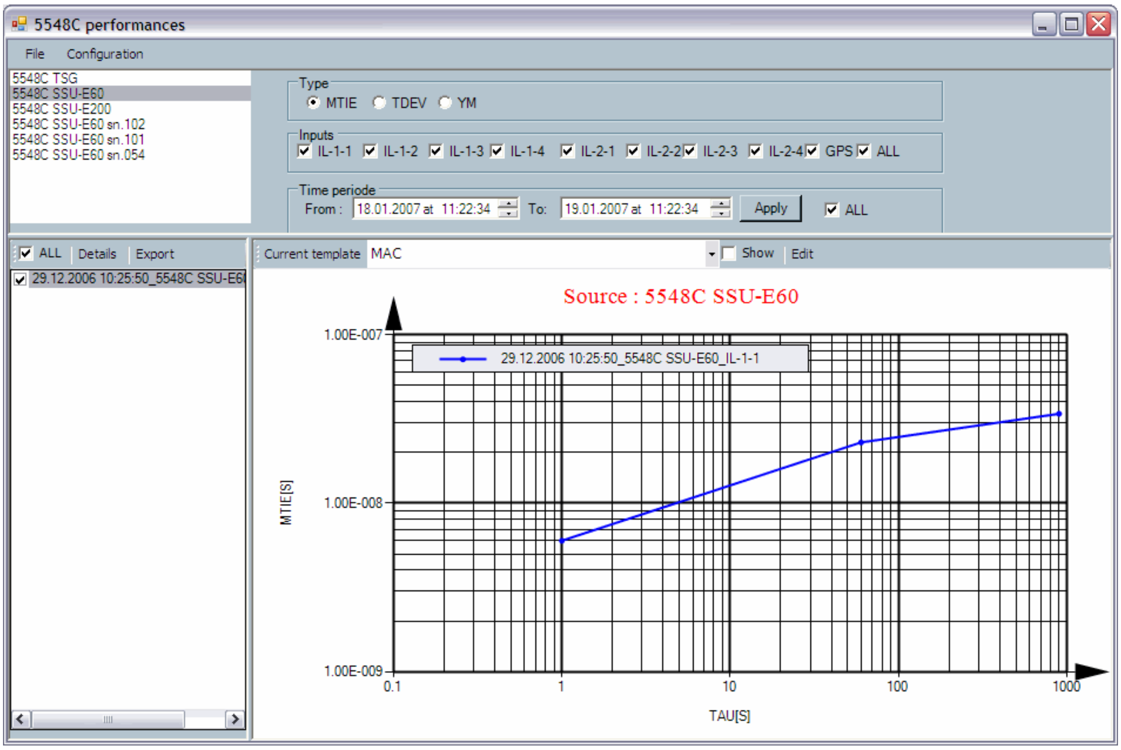
```
       sid   date  time
M      ctag  COMPLD
 "aid:kind,date,time:point1,point2,point3,point4,point5,point6"
;
```

Parameter name	Possible configurations	Default	Description
AID	IL-1-1…IL-1-4, GPS		This parameter is the input line to select for retrieving its PM results
KIND	MTIE, TDEV, YM		This is the type of value to retrieve
SET	1…9	1	This is the PM set to retrieve, 1 is the currently calculated (result by default). 2 is the previously stored and the 9 is the oldest one.
DATE*	2004-01-01..2099-12-31		This is the PM set date
TIME*	00-00-00..23-59-59		This is the PM set time
POINT1*	1E-9..1E0		For MTIE: MTIE_1S For TDEV: TDEV_1S For YM: YM_60S
POINT2*	1E-9..1E0		For MTIE: MTIE_1M For TDEV: TDEV_4S For YM: YM_540S
POINT3*	1E-9..1E0		For MTIE: MTIE_15M For TDEV: TDEV_16S For YM: YM_15M
POINT4*	1E-9..1E0		For MTIE: MTIE_30M For TDEV: TDEV_64S For YM: YM_1H
POINT5*	1E-9..1E0		For MTIE: MTIE_1H For TDEV: TDEV_256S For YM: YM_2H
POINT6*	1E-9..1E0		For MTIE: MTIE_3H For TDEV: TDEV_1000S For YM: YM_3H

*: Not software selectable

Using SyncView

Open *Performances*



Note:

Refer to the SyncView manual for Performances Interface description and use.

6.12.5 Receiving Spontaneous Measurement Results

Once the OSA 5548C SSU is able to provide a first PM result or an update, it will show it as an autonomous message formatted as below.

Output Syntax

```
      sid   date  time
atag  REPT  PM
 "aid:kind,date,time:point1,point2,point3,point4,point5,point6"
;
```

Parameter name	Possible configurations	Default parameters	Description
AID	IL-1-1…IL-1-4, GPS		This parameter is the input line from which the result is received
KIND	MTIE, TDEV, YM		This is the type of value received
DATE	2004-01-01..2099-12-31		This is the PM set date
TIME	00-00-00..23-59-59		This is the PM set time
POINT1	1E-9..1E0		For MTIE: MTIE_1S For TDEV: TDEV_1S For YM: YM_60S
POINT2	1E-9..1E0		For MTIE: MTIE_1M For TDEV: TDEV_4S For YM: YM_540S
POINT3*	1E-9..1E0		For MTIE: MTIE_15M For TDEV: TDEV_16S For YM: YM_15M
POINT4*	1E-9..1E0		For MTIE: MTIE_30M For TDEV: TDEV_64S For YM: YM_1H
POINT5*	1E-9..1E0		For MTIE: MTIE_1H For TDEV: TDEV_256S For YM: YM_2H
POINT6*	1E-9..1E0		For MTIE: MTIE_3H For TDEV: TDEV_1000S For YM: YM_3H

6.12.6 Performance Threshold Parameters

The OSA 5548C SSU can be configured to disqualify an input line based on performance outside a user define MTIE, TDEV or Ym threshold.

6.12.6.1 Default MTIE Threshold

According to ITU-T G.812 clock input section 9.1.1, the default MTIE threshold (mask) configured in the OSA 5548C SSU is described in the table below:

MTIE TAU	MTIE [S]
MTIE-1S	0.75E-6
MTIE-1M	2.0E-6
MTIE-15M	4.5E-6
MTIE-30M	5.0E-6
MTIE-1H	5.0E-6
MTIE-3H	5.0E-6

Table 6-21 Default MTIE Threshold

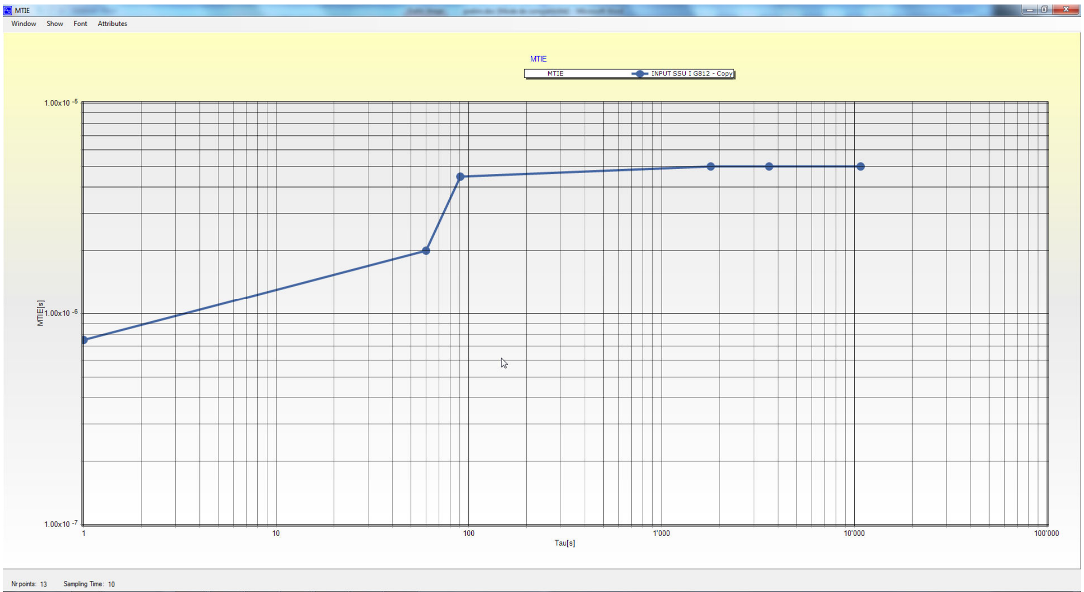


Figure 6-21 : Default MTIE Threshold

6.12.6.2 Default TDEV Threshold

According to ITU-T G.812 clock input section 9.1.2, the default TDEV threshold (mask) configured in the OSA 5548C SSU is described in the table below:

TDEV TAU	TDEV [S]
TDEV-1S	0.34E-7
TDEV-4S	0.34E-7
TDEV-16S	0.34E-7
TDEV-64S	1.08E-7
TDEV-256S	1.70E-7
TDEV-1000S	1.70E-7

Table 6-22 Default TDEV Threshold

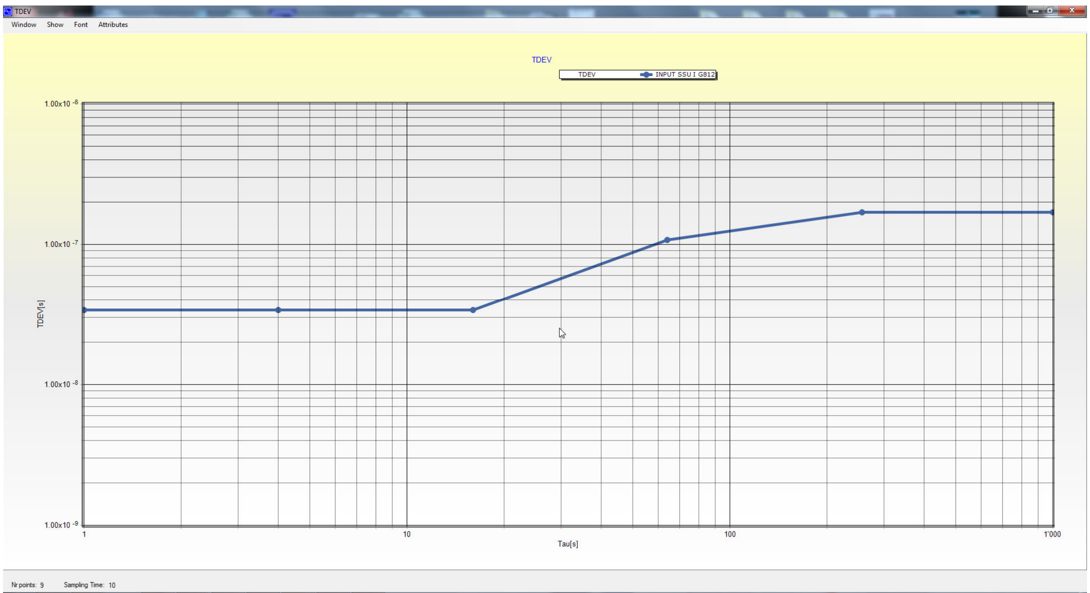


Figure 6-22 : Default TDEV Threshold

6.12.6.3 Default Ym Threshold

According to GR-1244 section R3-30 related to ST3, the default Ym threshold (mask) configured in the OSA 5548C SSU is described in the table below:

Ym time	Ym
Ym-60S	± 1.2E-5 (12ppm)
Ym-540S	± 1.2E-5 (12ppm)
Ym-15M	± 1.2E-5 (12ppm)
Ym-1H	± 1.2E-5 (12ppm)
Ym-2H	± 1.2E-5 (12ppm)
Ym-3H	± 1.2E-5 (12ppm)

Table 6-23 Default Ym Threshold

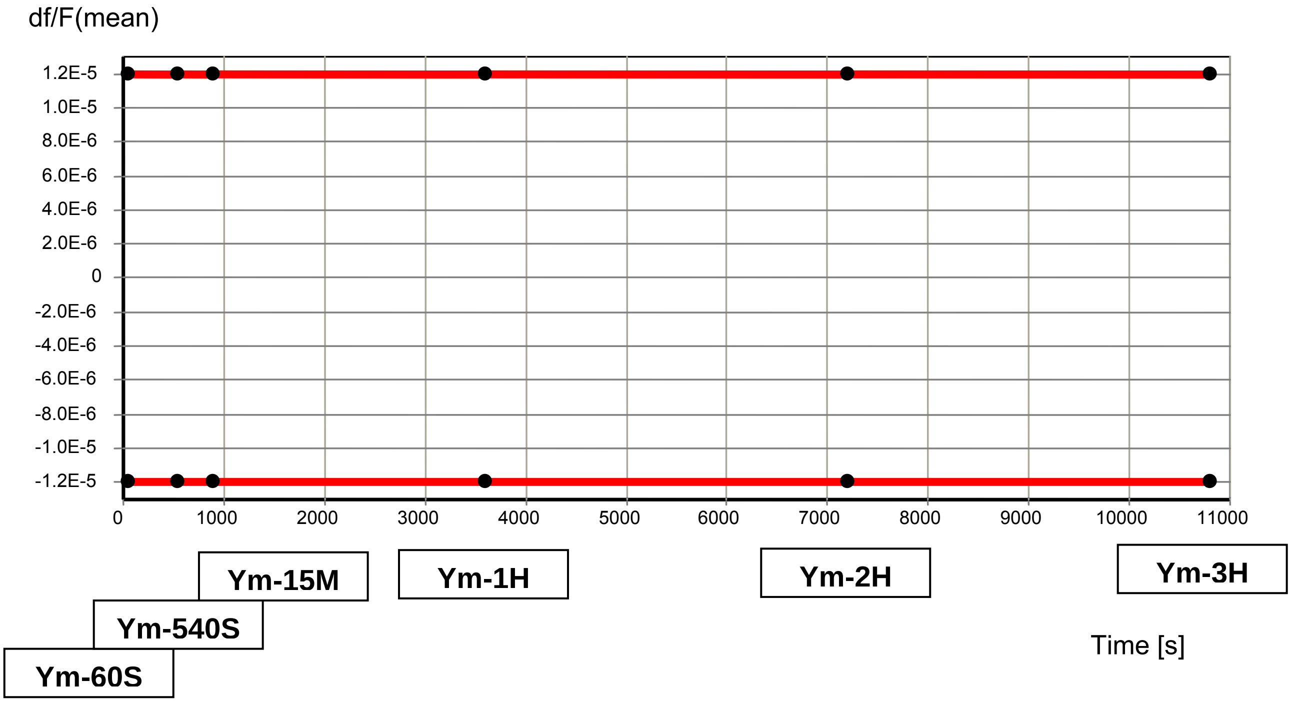


Figure 6-23 : Default Ym Threshold

6.12.6.4 Editing the PM threshold

The PMthreshold can be modified by the user for any input line.

The following command is required to retrieve the actual mask.

Input Syntax

```
RTRV-PM-TH::aid:ctag::kind;
```

Example:

```
RTRV-PM-TH::IL-2-3:MYCTAG::TDEV;
```

The response is formatted as below.

Output Syntax

```
       sid   date  time
M      ctag  COMPLD
 "aid:kind:point1,point2,point3,point4,point5,point6"
;
```

To set a threshold, the following TL1 command is necessary

Input Syntax

```
ED-PM-
TH::aid:ctag::kind:point1,point2,point3,point4,point5,point6;
```

Example:

```
ED-PM-TH::IL-1-2:MYCTAG::YM:5.2E-6,5.2E-6,5.2E-6,5.2E-6, 5.2E-
6,5.2E-6;
```

Parameter name	Possible configurations	Default parameters	Description
AID	IL-1-1…IL-1-4, GPS		This parameter is the input line for which you want to retrieve or edit the mask
KIND	MTIE, TDEV, YM		This is the type of mask
POINT1	1E-9..1E0		For MTIE: MTIE_1S For TDEV: TDEV_1S For YM: YM_60S
POINT2	1E-9..1E0		For MTIE: MTIE_1M For TDEV: TDEV_4S For YM: YM_540S

Parameter name	Possible configurations	Default parameters	Description
POINT3	1E-9..1E0		For MTIE: MTIE_15M For TDEV: TDEV_16S For YM: YM_15M
POINT4	1E-9..1E0		For MTIE: MTIE_30M For TDEV: TDEV_64S For YM: YM_1H
POINT5	1E-9..1E0		For MTIE: MTIE_1H For TDEV: TDEV_256S For YM: YM_2H
POINT6	1E-9..1E0		For MTIE: MTIE_3H For TDEV: TDEV_1000S For YM: YM_3H

6.13 Firmware Download

6.13.1 Overview

The OSA 5548C SSU incorporates a FTP (File Transfer Protocol) client which allows upgrading all its cards remotely from a FTP server.

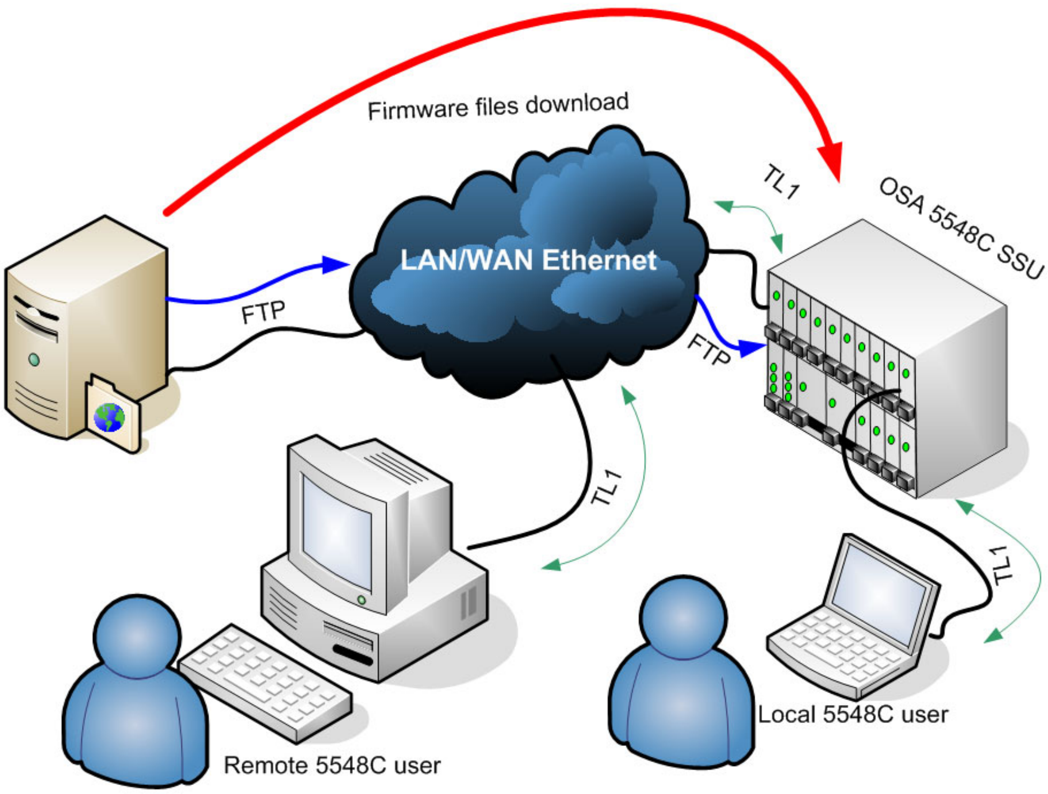


Figure 6-24 : Firmware Download Overview

The remote or the local user should configure the FTP server parameters in the 5548C SSU. Then, the user downloads the firmware files to the OSA 5548C SSU.

Once the download completed, the firmware files are stored in the MAC card. Thereafter, the user can upgrade any card in the shelf by transferring the firmware from the MAC card to the intended card.

6.13.2 Prerequisites

6.13.2.1 FTP Server

An FTP server on the OSA 5548C network is required to download files to the shelf. IP address, username and password access of that server are required.

6.13.2.2 Firmware Files

Before gaining FTP server access from the 5548C, the firmware files are placed in a folder in the FTP root of the server.
The complete files contain 1 file per card type, 4 files for the MAC cards and 1 catalog (CATALOG.CAT) file.

6.13.3 Firmware Download and Installation

6.13.3.1 FTP Parameters Configuration

The first step in the download procedure is to configure the FTP client parameters in the OSA 5548C SSU.

The following parameters can be configured in the OSA 5548C SSU.

- **IP Address (FTP)**
  This is the external FTP server's IP address
- **Source Path (SRC_PATH)**
  This is the path to the directory where the firmware files are located from the root of the external FTP server
- **User (USER)**
  This is the user identification to access the external FTP server
- **Password (PWD)**
  This is the password identification to access the external FTP server

IMPORTANT:

The password must contain only uppercase characters (A-Z), spaces and numbers (1-9)

Using TL1

To set the FTP server parameter in the OSA 5548C, the following command is required.

Input Syntax

```
SET-DNLD:::ctag::ftp,src_path,user,pwd;
```

Example:

```
SET-DNLD:::MYCTAG::149.133.41.52,5548C_V2,USER20,PWD99;
```

To retrieve or to check the configuration, use the following command.

Input Syntax

```
RTRV-DNLD:::ctag;
```

The response is formatted as below.

Output Syntax

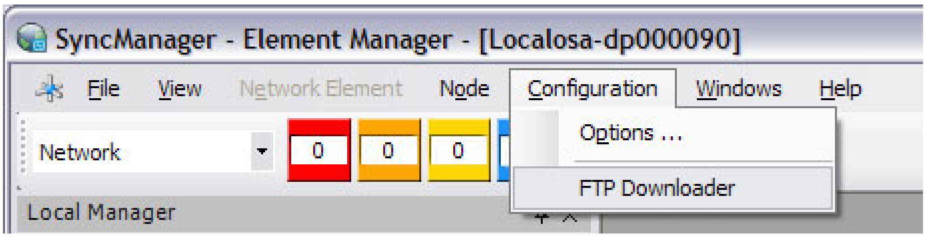
```
       sid  date time
M      ctag COMPLD
       "ftp,src_path,user"
;
```

Parameter name	Possible configurations	Default parameters	Description
FTP	0.0.0.0…255.255.255.255 or the FTP domain name		IP address of the FTP server where the firmware files can be downloaded
SRC_PATH			This is the path where the folder is located from the root of the FTP server.
USER			User name to access the FTP server
PWD*			Password to access the FTP server

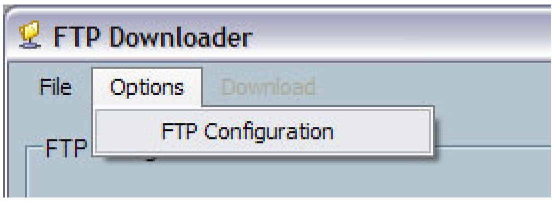
Table 6-24 Not retrievable with TL1 commands for evident security reason.

Using SyncView

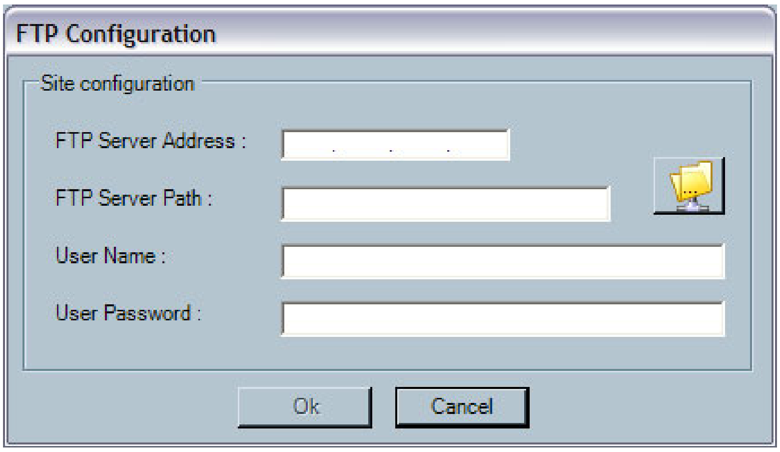
Go to *Configuration* → *FTP Downloader*



Go to *Options* → *FTP Configuration*



Introduce the *FTP IP Address*, the path (*FTP Server Path*) to where the Firmware files are located in the server from the root, the *FTP User Name* and *Password* and click *OK*



6.13.3.2 Downloading Files from the FTP Server

After setting-up the FTP configuration in the OSA 5548C SSU, the download of the firmware files from the FTP server to the MAC card can be executed.

Recommendation:

Check that the Ethernet connection between the FTP server and the OSA 5548C SSU is correctly established prior to starting the file download.

***Note*:**

After download completes, the files are stored in the MAC card, however, cards are not upgraded yet. For card upgrading, follow the next section.

Using TL1

The following TL1 command is required to start the download.

Input Syntax

```
OPR-DNLD:::ctag;
```

During the download progress, you should receive the following message.

Output Syntax

```
        sid   date  time
M       ctag  IP
;
```

***Note*:**

If it is required to abort the download progression, use the following command.

Input Syntax

```
ABT-DNLD:::ctag;
```

Once the download is successfully completed, the message below is displayed.

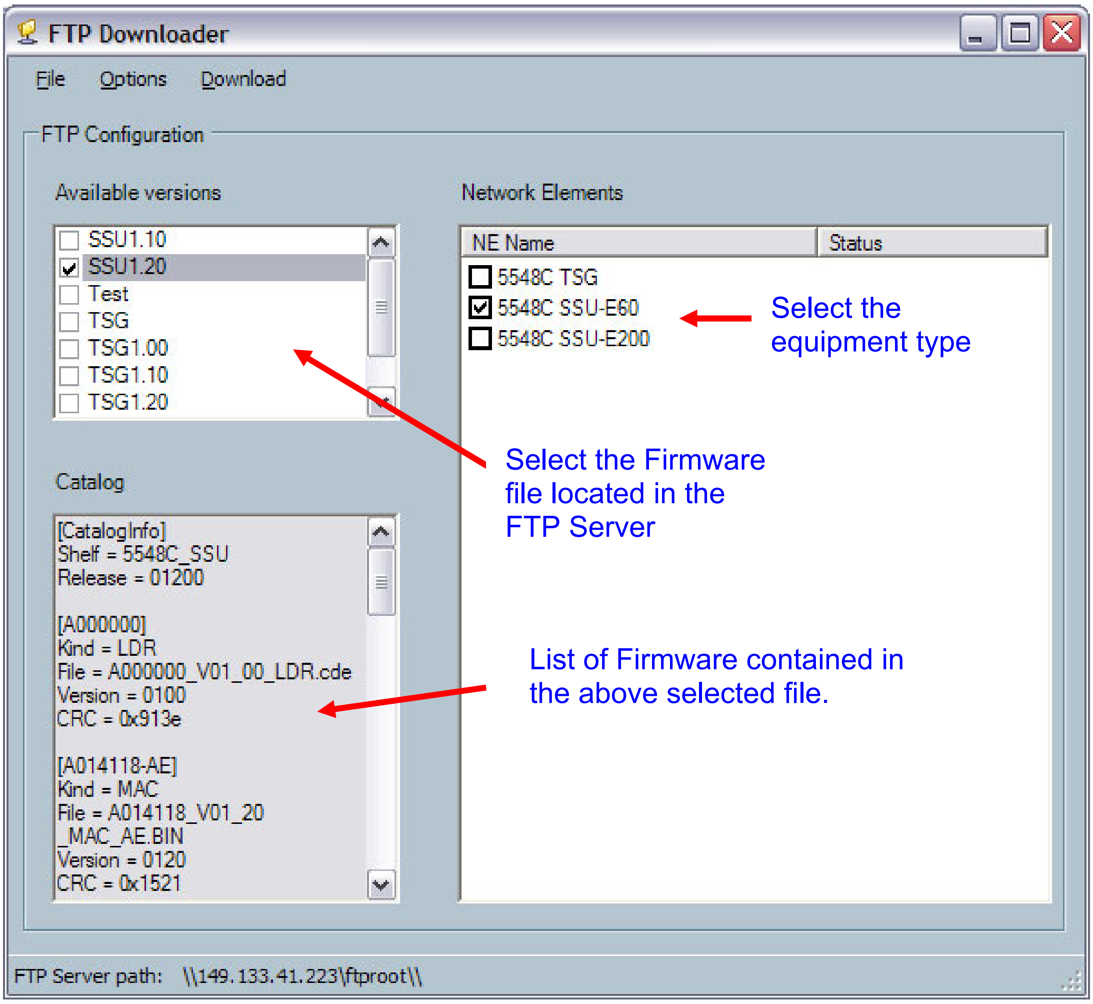
Output Syntax

```
        sid   date  time
M       ctag  COMPLD
;
```

Using SyncView

Go to *Configuration* → *FTP Downloader*

The main window will show the following. Select the Equipment type, the available version required to be downloaded and click on the Download Button to execute the download process.



6.13.3.3 Installing New Firmware into a Card

Once the MAC card receives the downloaded files, the user can transfer the file to any card.

The user can install new firmware in a single card (recommended) or in a card group, in the A or B card of the same card type.

Recommendation:

While a card is being upgraded with a new firmware, its function will be interrupted, causing a possible signal output outage. Single card upgrade operations are recommended to avoid shelf synchronization service outages on the whole shelf.

Example: if you need to install the firmware into the INC-1-**A**, verify that the INC-1-**B** protection mate is installed to protect it as the **A** card will not be able to supply signal when it is being initialized.

A few exceptions can avoid the loss of synchronization service, such as the following examples

1. If an INC card is unprotected and you have at least one THC installed in the shelf, the THC will run in holdover during the firmware installation of the INC in question and continue to provide a good signal on the output.
2. If you have only one THC card installed and at least one INC in the group 1 (INC-1-A or INC-1-B), the shelf will continue in pass-through mode during THC download.

The following command is required to install new firmware in any card from the MAC card.

***Note*:**

The MADDS is a component embedded in the THC cards, which needs to be upgraded right after the THC card itself.

MADDS-A is embedded in THC-A and MADDS-B in THC-B.

Using TL1

Input Syntax

`ACT-DNLD::aid:ctag;`

Example:

`ACT-DNLD::MADDS-B:MYCTAG;`

Parameter name	Possible configurations	Description
AID	INC-1-A..INC-1-B, INC-A, INC-B, INC, GPS-A, GPS-B, GPS, THC-A, THC-B, THC, MADDS-A, MADDS-B, MADDS, SGC-A, SGC-B, SGC, OUC-1-A..OUC-3-B, OUC-A, OUC-B, OUC, MAC-A, MAC-B, MAC	This is the card or the card group where you want to install the new firmware

***Note*:**

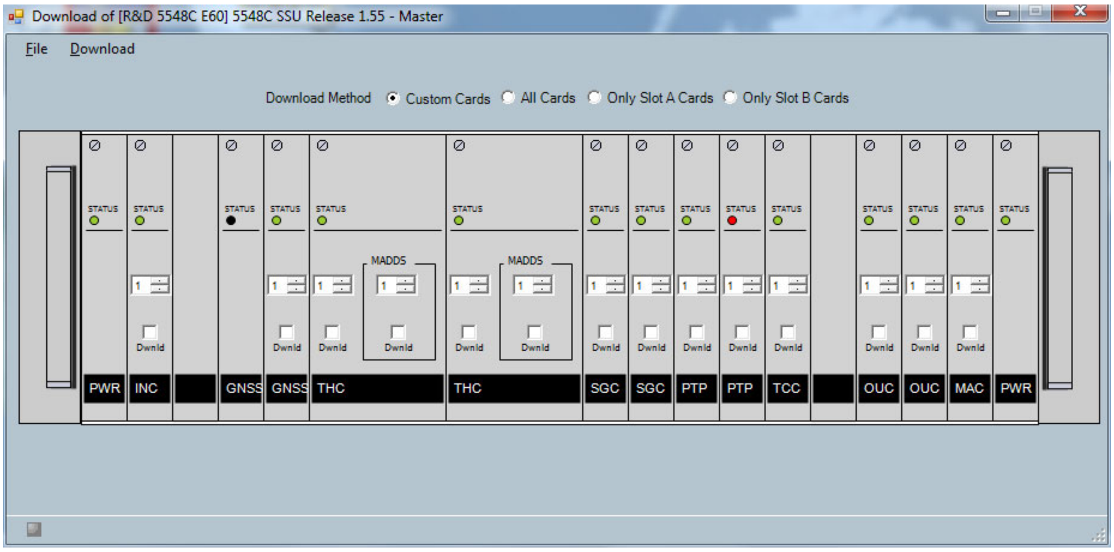
If you need to do a roll back to the previous card version, follow the next section.

Using SyncView

Open the *Downloader* →

Select the card to upgrade by clicking on the checkbox “Dwnld”; and then start the upgrade process by clicking the Download button.

The list of number on each card can be used to make an upgrade sequence of card upgrade starting from one to the highest number set. The Download Method can be set to upgrade all cards at the same time.



6.13.3.4 Roll Back to the Previous Firmware Version[1]

In case of unexpected condition or eventual firmware issues after upgrade, the OSA 5548C is able to reinstall the previous version. The following command is required.

Recommendation:

It is recommended to contact a Customer Support Representative before applying this command.

Input Syntax

```
DLT-DNLD::aid:ctag;
```

Example:

```
DLT-DNLD::THC-A:MYCTAG;
```

Parameter name	Possible configurations	Description
AID	INC-1-A..INC-1-B, INC-A, INC-B, INC, GPS-A, GPS-B, GPS, THC-A, THC-B, THC, MADDS-A, MADDS-B, MADDS, SGC-A, SGC-B, SGC, OUC-1-A..OUC-3-B, OUC-A, OUC-B, OUC, MAC-A, MAC	This is the card or the card group where you want to reapply the previous version.

[1] Not implemented yet

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Chapter

7. Commissioning

Including:

- ❖ Introduction
- ❖ Configuration & Provisioning Procedures
- ❖ Test and Verification Procedure

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7.1 Introduction

7.1.1 Overview

This chapter contains quick configuration and test procedures in order to set-up the OSA 5548C SSU rapidly with fewer details than the previous chapter.

7.1.2 Prerequisites

Chapter 3 and 4 must be read before following this chapter, chapter 6 is an asset to better understanding the configuration protocols described in this chapter.

7.1.3 Requirements

To make configuration and tests, the following material and elements are required:

For basic tests and configuration

- The OSA 5548C SSU has already powered-up and the MAC card has ended its starting procedure as per described in chapter 5.
- A computer or laptop with the SyncTerminal or SyncView PLUS software installed
- A serial NULL MODEM or AT-LINK cable with SUB-D 9 pins RS-232C terminations
- A multimeter and an oscilloscope bandwidth of at least 30 MHz
- A flat screwdriver

For remote Ethernet connection

- A LAN/WAN Ethernet network
- A 10 Base-T cable with RJ-45 terminations
- A computer with Ethernet card embedded
- An IP address for the OSA 5548C SSU itself, the Mask address of the LAN/WAN, the eventual Gateway IP addresses and mask addresses
- Optional: It is also possible to use a cross-connected 10 Base-T cable with RJ-45 in order to make direct connection between your computer and the OSA 5548C SSU without passing through a LAN

7.2 Configuration & Provisioning Procedures

7.2.1 Introduction

7.2.1.1 Overview

This section describes the main procedures to make the OSA 5548C working as required.

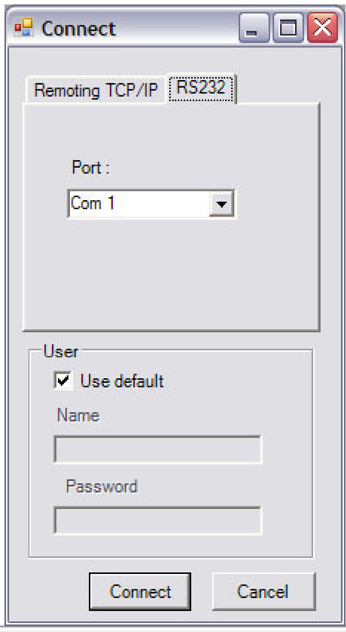
7.2.1.2 Requirements

The user should have a basic knowledge of TL1 command format and rules, such as described in chapter 6.

The SyncTerminal should be used to send TL1 commands as the most efficient way to configure and provision the OSA 5548C SSU.

7.2.2 Establishing Communication

7.2.2.1 Serial Connection & Login

STEP	ACTION
1	Connect one serial cable end to the front or the rear LOCAL COMM. Port
2	Connect the second serial cable end into the serial port of your computer
3	Start the SyncView software
4	Connect the 5548C via RS-232 using the default login and password 

STEP	ACTION
5	Launch the SyncTerminal interface

6	A new window on the right where it should be written:
	
	`Connecting to COM1 (or COM2)`
	`Connected`

Procedure 7-1 Serial Connection

7.2.2.2 Ethernet Configuration

Note:

For the first time, you need to configure the Ethernet network parameters via serial connection.

STEP	ACTION

1	Enter the following TL1 command in one single line:
	
	`ED-COM-SYS:::CTAG::[IPADDRESS=###.###.###.###],`
	`[NETMASK=###.###.###.###],`
	`[GW1ADDRESS=###.###.###.###],`
	`[GW1NETMASK=###.###.###.###],`
	`[GW2ADDRESS=###.###.###.###],`
	`[GW2NETMASK=###.###.###.###],`
	`[ETHER_SPEED=10/100];`
	
	Follow what the SyncTerminal prompt to set the parameters and press enter.

2	Then, if the configuration has been settled correctly, you should be prompted with the following answer
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`;`

3	Then, it is necessary to reboot the MAC card with the following command: `INIT-SYS::MAC-A:CTAG::WARM;`
4	Wait until the MAC has ended its reboot cycle

Procedure 7-2 Ethernet Configuration

7.2.2.3 Verifying the Ethernet Configuration

STEP	ACTION
1	To check if the Ethernet configuration has been done correctly, send the following TL1 command: `RTRV-COM-SYS:::CTAG;`

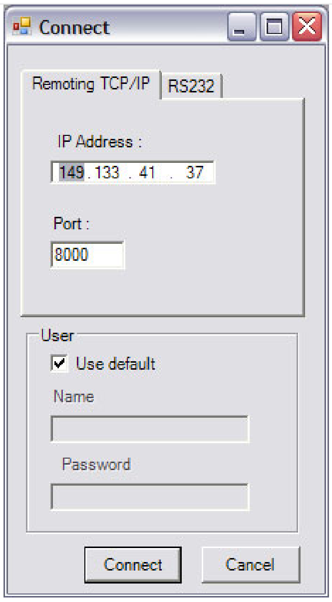
2	Then if the configuration has settled correctly, you should be prompted with the following answer
	`   SID DATE TIME`
	`M  CTAG COMPLD`
	`   "Here are the parameters you have configured"`
	`;`

3	If the OSA 5548C is already connected to an Ethernet network, you can send a “PING” (START > RUN > CMD > write “`PING xxx.xxx.xxx.xxx`” replacing the x with the IP address) from any computer or device connected in the same network to query the connection.

Procedure 7-3 Verifying the Ethernet Configuration

7.2.2.4 Ethernet Connection

STEP	ACTION
1	Connect a 10 or 100 Base-T cable with RJ-45 terminations into the connector labeled “LAN COMM.” and the other end plugged into the Ethernet network LAN/WAN.
2	If not yet done, connectyour computer to the same Ethernet Network and control that your IP address, Subnet Mask address as well as the Gateway setting are correctly configured to work within the LAN.
3	Run the SyncView software

STEP	ACTION
4	Connect the 5548C via TCP/IP using the IP configured in the shelf. 
6	Right-click on the 5548C Symbol and select SyncTerminal

7	Then the SyncTerminal shold be shown with the following sentence:
	
	`Connecting to XXX.XXX.XXX.XXX:8000...`
	`Connected`
	
	XXX.XXX.XXX.XXX is the IP address of the shelf

Procedure 7-4 Ethernet Connection

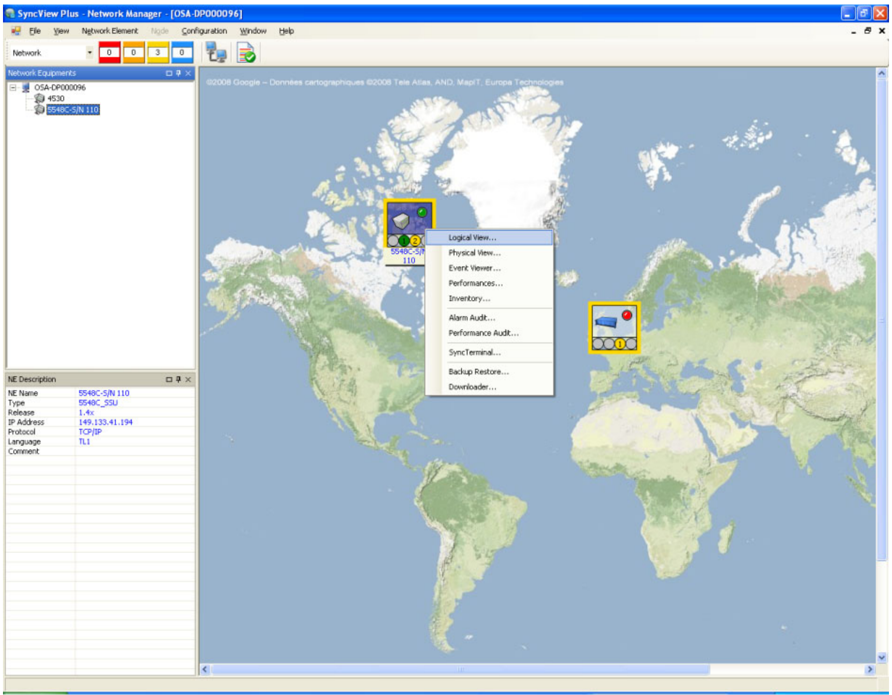
7.2.2.5 NTP Connection Procedure

STEP	ACTION
1	Connect a 10 or 100 Base-T cable with RJ-45 terminations into the connector labeled “NTP.” and the other end plugged into the Ethernet network LAN/WAN.
2	If not yet done, connectyour computer to the same Ethernet Network and control that your IP address, Subnet Mask address as well as the Gateway setting are correctly configured to work within the LAN.
3	Run the SyncView software or Syncterminal

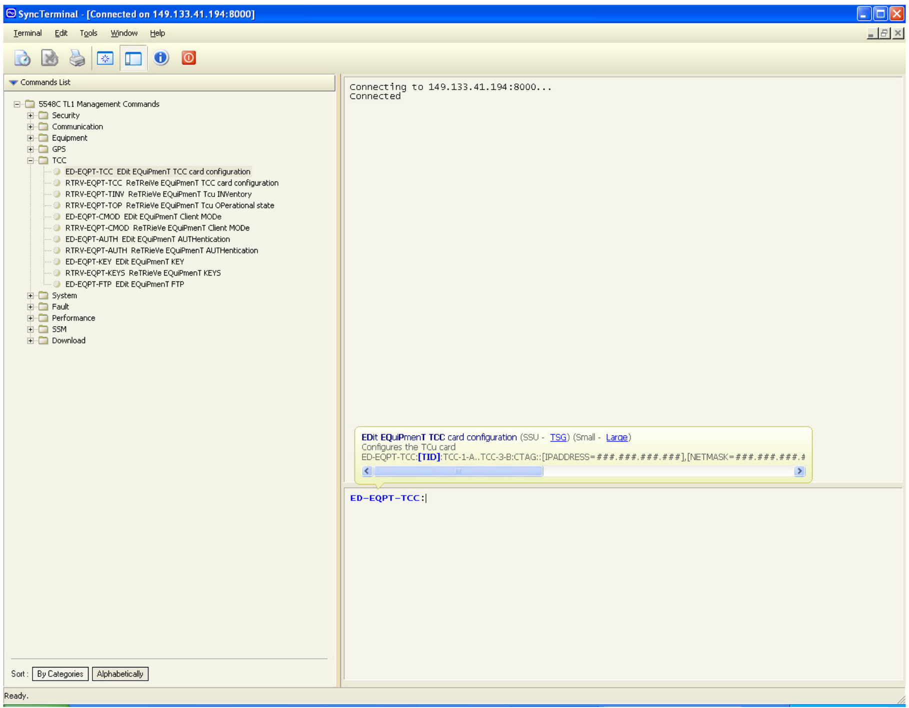
STEP	ACTION
4	Open the right windows

Using SyncView software

Click right mouse on the equipment and select physical or logical view



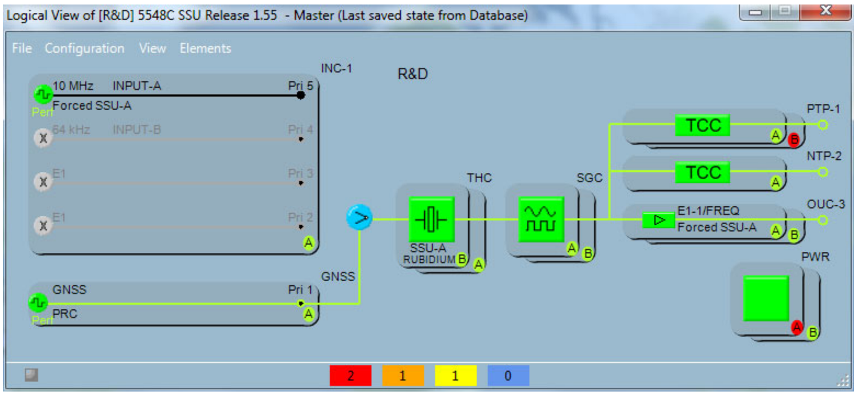
Using Syncterminal software



<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>5</td><td>

Using Syncview software (logical view)

Click right mouse on the TCC area and select “**details…**”

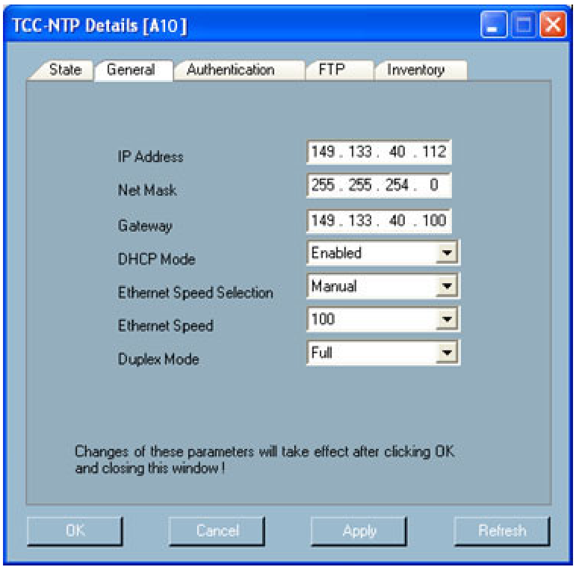


Using Syncterminal software

Select the “*ED-EQPT-TCC*” command.

</td></tr>
<tr><td>6</td><td>

Using Syncview software



Using Syncterminal software

Example:

`ED-EQPT-TCC::TCC-1-A:MYCTAG::IPADDRESS=123.100.124.120,GATEWAY=123.100.124.100,DHCP_MODE=ENABLE,ETHER_SDEF=AUTO,DUPLEX_MODE=FULL;`

</td></tr>
</table>

Procedure 7-5 NTP Connection

7.2.3 Firmware Upgrade Procedure by SyncTerminal

When an shelf upgrade firmware is required, proceed as follow:

STEP	ACTION
1	Install the FIRMWARE on a FTP server, which can be acceded by the OSA 5548C SSU

2	Configure the FTP parameters with following command:
	
	`SET-DNLD:::CTAG::`**`ftp_server_ip_address`**`,`
	`directory_name``,`**`user_name`**`,`**`password`**`;`
	
	Example:
	`SET-DNLD:::CTAG::`**`149.133.41.123`**`,`**`MAC48C`**`,`**`MYNAME`**`,`**`MYPWD`**`;`

3	Check the parameters with the following command: `RTRV-DNLD:::CTAG`

4	Download the firmware files from FTP to 5548C with the following command:
	
	`OPR-DNLD:::CTAG;`
	The following answer should be shown during download process:
	`IP CTAG`
	`<`
	`IP CTAG`
	`<`
	`IP CTAG`
	`<`
	
	Once completed, it is written an information as:
	
	`   SID DATE TIME`
	`M  CTAG COMPLD`
	`;`

5	To install the new firmware in any card, use the following command. **CAUTION:** Serious outage can result if the firmware installation is performed on an active card, as the card will not operate during download. It is recommended to upgrade card by card during the maintenance window or before placing the shelf in service. `ACT-DNLD::`**`INC/INC-1-A..INC-1-B/INC-A/INC-B/GPS/GPS-A/GPS-B/THC/THC-A/THC-B/MADDS/MADDS-A/MADDS-B/SGC/SGC-A/SGC-B/OUC/OUC-1-A..OUC-3-B/OUC-A/OUC-B/MAC-A/MAC-B/ALL`**`:CTAG;`

STEP	ACTION

	If the shelf is physically visible, the operator should see the STATUS LED in ORANGE during firmware installation.
	
	After sending the above command, the following answer should be shown during installation process:
	`IP CTAG`
	`<`
	`IP CTAG`
	`<`
	`IP CTAG`
	`<`
	
	Once completed, it is written an information as:
	
	`   SID DATE TIME`
	`M  CTAG COMPLD`
	`;`
	
	***Note*:**
	Do not forget to upgrade MADDS when upgrading the THC, as they belongs to the same card.

Procedure 7-6 Firmware Upgrade

7.2.4 FPGA Upgrade Procedure by SyncTerminal

When an card upgrade FPGA is required, proceed as follow:
Contact Technical assistance in chapter 8.6

Card concerned:

TCC-PTP
GNSS card

7.2.5 TopSync Upgrade Procedure by SyncTerminal

When an card upgrade FPGA is required, proceed as follow:
Contact Technical assistance in chapter 8.6

Card concerned:

TCC-PTP

7.2.6 General Configuration

7.2.6.1 Setting the OSA 5548C SSU Name (SID)

STEP	ACTION

1	Retrieve current name (**SID**) of the 5548C shelf:
	
	`RTRV-HDR:::CTAG;`
	
	And the answer should be shown as below:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`;`

2	To edit the name, enter the following TL1 command in one single line: **`SET-SID`**`:::CTAG::`**`MY5548C`**`;` Replace “MY5548C” with the name you want and press enter

3	Then, if the configuration has been settled correctly, you should be prompted with the following answer. The name should be shown instead of “MY5548C”
	
	`      MY5548C DATE TIME`
	`M     CTAG COMPLD`
	`;`

Procedure 7-7 Setting the OSA 5548C SSU Name (SID)

7.2.6.2 Setting the Date and Time

STEP	ACTION

1	Retrieve current Date and Time set in the 5548C shelf:
	
	`RTRV-HDR:::CTAG;`
	
	And the answer should be shown as below:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`;`

2	Enter the following TL1 command in one single line:
	`ED-DAT:::CTAG::YYYY-MM-DD,HH-MM-SS,HH-MM;`
	Replace "**YYYY-MM-DD**" by the date
	Replace "**HH-MM-SS**" by the time (on 24 hours)
	Replace" **HH-MM**" by the UTC offset (from -12-00 to 12-00)
	
	Example:
	`ED-DAT:::MYCTAG::2006-02-18,09-30-00,02-00;`

3	Then, if the configuration has been settled correctly, you should be prompted with the following answer with the date and time you have set.
	
	`      SID YYYY-MM-DD HH-MM-SS`
	`M     CTAG COMPLD`
	`;`

Procedure 7-8 Setting the Date and Time

7.2.6.3 Disabling Empty (Unused) Slots

To avoid receiving alarms (e.g. IMPROPER REMOVAL) from empty slots, we recommend disabling (delete) the empty slots.

STEP	ACTION
1	Locate the empty slot(s)
2	Send the following command, selecting the corresponding slot: `DLT-EQPT::INC-1-A..INC-1-B/GPS-A/GPS-B/THC-A/THC-B/SGC-A/SGC-B/OUC-1-A..OUC-3-B/MAC-A/MAC-B:CTAG;`
3	Verify then, that no alarms are reported by the slots deleted sending the following command: `RTRV-ALM::INC/INC-1/ GPS/THC/SGC/OUC/OUC-1..OUC-3/MAC/ALL:CTAG;`

Procedure 7-9 Disabling Empty (unused) Slots

7.2.7 Input Lines

7.2.7.1 E1 Input Line Configuration

STEP	ACTION
1	Check the E1 port where the input line (IL) you want to configure is connected.

2	Configure the connector (**E1_1** to **E1_4**) required to attribute to any of the 4 possible input lines (between **1-1** and **1-4**) sending the following command:
	
	`ED-EQPT-IL::input_line:CTAG::INPUT=E1_connector;`
	
	Example:
	`ED-EQPT-IL::1-1:MYCTAG::INPUT=E1_1;`

3	Configure the administration state of the line:
	“Enabled” to allow the 5548C to use it,
	“Disable”, to deactivate the line,
	“Monitored” to allow the OSA 5548C to measure performance without using it:
	
	`ED-EQPT-IL::input_line:CTAG::`
	`ADM_STATE=ENABLED/DISABLED/MONITORED;`

4	Configure the connection type made on the E1 connector (Bridged or Terminated) with the following command:
	
	`ED-EQPT-IL::input_line:CTAG::`
	`TERMINATION=TERMINATED/BRIDGED;`

5	Configure the code (AMI/HDB3) used in the E1 signal with following command: `ED-EQPT-IL::input_line:CTAG::CODE=AMI/HDB3;`
6	Configure the Wait-To-Restore time (WTR) which is a configurable delay to make the 5548C waiting before selected a line recovered. The delay can be disabled or configured between 1 and 12 minutes. `ED-EQPT-IL::input_line:CTAG::WTR=1..12/DISABLED;`

7	If necessary, attribute a tag to the input line, using the following command:
	
	`ED-EQPT-IL::input_line:CTAG::`
	`TAG=\”My Input Line Tag\”;`

8	Once the configuration finished you can check it with the following command: `RTRV-EQPT-IL::input_line:CTAG;`

STEP	ACTION

9	Then the SyncTerminal should show the following message in one single line where you can check the bold/blue parameters:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "`**`input_line`**`:`**`OK`**`,`**`ENABLED/DISABLED/MONITORED`**`,`
	`PRC/SSU_A/SSU_B/SEC/DNU/NONE/DISABLED:`
	`INPUT=`**`E1_connector`**`,`
	`ADM_STATE=`**`ENABLED/DISABLED/MONITORED`**`,`
	`TERM=`**`TERMINATED/BRIDGED`**`,`
	`CODE=`**`B8ZS/AMI`**`,`
	`WTR=`**`1..12/DISABLED`**`,`
	`FRCD=PRC/SSU_A/SSU_B/SEC/DNU/NONE,`
	`OOF_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`CRC4_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`BPV_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`SA4=OFF/ON/SSM,SA5=OFF/ON/SSM,SA6=OFF/ON/SSM,`
	`SA7=OFF/ON/SSM,SA8=OFF/ON/SSM,FREQ=2.048M",`
	`TAG=`**`\”My Input Line Tag\”`**`"`
	`;`

10	On the active INC card of the corresponding group, the LED related to the Input Line you configured, should either flashes in Green due to Wait-To-Restore time, or lights permanently in Green.

Procedure 7-10 E1 Input Line Configuration

Note:

Further details on alarm detection (OOF, CRC-4, BPV and CV) configuration are described in section 6.5.4.5

7.2.7.2 Frequency Input Line Configuration

STEP	ACTION
1	Check the FREQ. BNC connector where the line you want to configure is connected.

2	Configure the connector (**FREQ_1** to **FREQ_4**) required to attribute to any of the 4 possible input lines (between **1-1** and **1-4**) sending the following command:
	
	`ED-EQPT-IL::`**`input_line`**`:CTAG::INPUT=`**`FREQ_connector`**`;`
	
	Example:
	`ED-EQPT-IL::`**`1-2`**`:MYCTAG::INPUT=`**`FREQ_1`**`;`

STEP	ACTION

3	Configure the administration state of the line:
	“Enabled” to allow the 5548C to use it,
	“Disable”, to deactivate the line,
	“Monitored” to allow the OSA 5548C to measure performance without using it:
	
	`ED-EQPT-IL::`**`input_line`**`:CTAG::`
	`ADM_STATE=`**`ENABLED/DISABLED/MONITORED`**`;`

4	Configure the Wait-To-Restore time (WTR) which is a configurable delay to make the 5548C waiting before selected a line recovered. The delay can be disabled or configured between 1 and 12 minutes. `ED-EQPT-IL::`**`input_line`**`:CTAG::WTR=`**`1..12/DISABLED`**`;`

5	If necessary, attribute a tag to the input line, using the following command:
	
	`ED-EQPT-IL::`**`input_line`**`:CTAG::`
	`TAG=`**`\”My Input Line Tag\”`**`;`

6	Once the configuration finished you can check it with the following command: `RTRV-EQPT-IL::`**`input_line`**`:CTAG;`

7	Then the SyncTerminal should show the following message in one single line where you can check the bold/blue parameters:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "`**`input_line`**`:`**`OK`**`,`**`ENABLED/DISABLED/MONITORED`**`,`
	`PRC/SSU_A/SSU_B/SEC/DNU/FAILED/NONE/DISABLED:`
	`INPUT=`**`FREQ_connector`**`,`
	`ADM_STATE=`**`ENABLED/DISABLED/MONITORED`**`,`
	`TERM=TERMINATED,`
	`CODE=B8ZS/AMI,`
	`WTR=`**`1..12/DISABLED`**`,`
	`FRCD=PRC/SSU_A/SSU_B/SEC/DNU/NONE,`
	`OOF_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`CRC4_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`BPV_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`SA4=OFF/ON/SSM,SA5=OFF/ON/SSM,SA6=OFF/ON/SSM,`
	`SA7=OFF/ON/SSM,SA8=OFF/ON/SSM,FREQ=`**`the frequency`**
	`fed``",TAG=`**`\”My Input Line Tag\”`**`"`
	`;`

8	On the active INC card of the corresponding group, the LED related to the Input Line you configured, should either flashes in Green due to Wait-To-Restore time, or illuminates in solid Green.

Procedure 7-11 Frequency Input Line Configuration

7.2.7.3 Disabling an Unused Input Line

The purpose of disabling an unused input line, is to suppress alarms.

STEP	ACTION
1	To discover which cards are unused, check the INC card input LEDs for RED condition after configuring the lines, and connecting them.
2	Then simply send the following command to all the unused lines: `ED-EQPT-IL::input_line:CTAG::ADM_STATE=DISABLED;`
3	Once the command is sent, the Red LED should be extinguished

Procedure 7-12 Disabling an Unused Input Line

7.2.8 GPS Input

7.2.8.1 GPS Input Line Configuration

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>1</td><td>Retrieve current configuration

<code>RTRV-EQPT-GPS:::ctag;</code>
Example:
<code>RTRV-EQPT-GPS:::MYCTAG;</code>

The response is formatted as below.

<u>Output Syntax</u>
<pre>
      sid date time
 M   ctag COMPLD

"opstate,ssm:PPS_OFFSET=-999'999..999'999,
ADM_STATE=ENABLE/MONITORED/DISABLED,
INDOOR=ON/OFF,ELEVATION=5…90,
FRCD= PRC,SSU_A,SSU_B,SEC,DNU,NONE,
VISIBLE=0…12,TRACKED=0…12"
;
</pre>Verify that at least 4 satellites are tracked.</td></tr>
</table>

2	Configure the administration state of the line:
	“Enabled” to allow the 5548C to use it,
	“Disable”, to deactivate the line,
	“Monitored” to allow the OSA 5548C to measure performance without using it:
	
	`ED-EQPT-GPS:::ctag::`
	`ADM_STATE=`**`ENABLED/DISABLED/MONITORED`**`;`

Procedure 7-13 GPS Input Line Configuration

7.2.9 Input Line Switching, Selection & Priorities

7.2.9.1 Switching and Selection Mode Configuration

STEP	ACTION
1	Establish and plan how to configure the selection mode between the input lines when one is rejected or failed: • Switching mode over the input line - Automatic (by default) - Manual (only one specific input line) - Forced Holdover

2	Configure the switching mode with the following command:
	
	`ED-EQPT-THC:::CTAG::`
	`MODE=`**`AUTO/MAN/FHLDVR`**`,`
	`[MAN_INPUT=`**`IL-1-1/IL-1-2/IL-1-3/IL-1-4/GPS`**`]`
	`;`
	
	Configure the parameter “MAN_INPUT” with the input line you want only if you selected the Manual mode (MAN).

4	Verify the parameters settled with the below TL1 command: `RTRV-EQPT-THC:::CTAG;`

5	The response is formatted such as below:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "OK:MODE=`**`AUTO/MAN/FHLDVR`**`,`
	`MAN_INPUT=`**`IL-1-1/IL-1-2/IL-1-3/IL-1-4/GPS`**`,`
	`ACT_INPUT=IL-1-1/IL-1-2/IL-1-3/IL-1-4/GPS,`
	`SSM=OFF/ON,SYS_MODE=MST"`
	`;`

Procedure 7-14 Switching and Selection Mode Configuration

7.2.9.2 Input Line Priorities Configuration

When the selection mode has been set as AUTOMATIC, this configuration is required to set the priority on the input line. When two Input Lines (IL) are set with the same priority, the system selects the IL in non-reversive mode.

STEP	ACTION
1	1 is the highest priority and 5 the lowest. To set the priorities, send the following TL1 command: `ED-PRIO:::CTAG::IL-1-1=1..5,IL-1-2=1..5,IL-1-3=1..5,IL-1-4=1..5,GPS=1..5;`
2	Verify the priority setting with the following TL1 command: `RTRV-PRIO:::CTAG;`

3	The response is formatted such as below:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "IL-1-1=1..5,IL-1-2=1..5,IL-1-3=1..5,IL-1-4=1..5,GPS=1..5"`
	`;`

Procedure 7-15 Input Line Priorities Configuration

***Note*:**

The line currently selected is shown on the digital display on the currently active THC card.

7.2.10 Output Line Configuration

7.2.10.1 E1 Output Signal Type Configuration

Two E1 configurations options can be applied to all Output Groups (OG).

***Note*:**

One OG contains 10 Output Lines (OL). Each OUC groups provide 2 OG (OL 1 to 10 and OL 11 to 20) for a total of 20 OL.

STEP	ACTION

1	Configure one of the two E1 options (E1-1 or E1-2) with the following parameters:
	• Code : HDB3 or AMI
	• CRC-4 (CRC4): ON or OFF
	• Time Slot 16 (TS16): CCS or CAS
	• Idle code (IDLE): 0…255
	
	`ED-EQPT-SGE::E1-1/E1-2:CTAG::`
	`CODE=HDB3/AMI,CRC4=OFF/ON,TS16=CCS/CAS,IDLE=0…255;`

2	Check the quality configured with the following command: `RTRV-EQPT-SGE::E1-1/E1-2:CTAG;`

3	Check the value written in blue:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "E1-1/E1-2:CODE=HDB3/AMI,CRC4=ON/OFF,TS16=CCS/CAS,`
	`SA4=OFF/ON/SSM,SA5=OFF/ON/SSM,SA6=OFF/ON/SSM,`
	`SA7=OFF/ON/SSM,SA8=OFF/ON/SSM,IDLE=0…255"`
	`;`

4	Select the E1 configuration option (TYPE) to the Output Group (OG) required. `ED-EQPT-OG::1-1…3-2:CTAG::TYPE=E1_1/E1_2;`
5	Retrieve the E1 configuration option with the following command. `RTRV-EQPT-OG::1-1…3-2:CTAG;`

6	Check the value written after the “TYPE=”:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "1-1…3-2:TYPE=E1_1,E1_2"`
	`;`

Procedure 7-16 E1 Output Signal Type Configuration

7.2.10.2 Frequency Output Signal Configuration

***Note*:**

One OG contains 10 Output Lines (OL). Each OUC groups provide 2 OG (OL 1 to 10 and OL 11 to 20) for a total of 20 OL.

STEP	ACTION
1	Set the Frequency configuration option (TYPE) to the Output Group (OG) required. `ED-EQPT-OG::1-1…3-2:CTAG::TYPE=FREQ;`
2	Retrieve the E1 configuration option with the following command. `RTRV-EQPT-OG::1-1…3-2:CTAG;`

3	Check the value written after the “TYPE=”:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "1-1…3-2:TYPE=FREQ"`
	`;`

Procedure 7-17 Frequency Output Signal Configuration

7.2.10.3 NTP Output Signal Configuration

STEP	ACTION
1	If section 6.9.5 is properly done and section 8.2.1.7 succefully run. NTP output signal works properly.

Procedure 7-18 NTP Output Signal Configuration

7.2.11 SSM Configuration

7.2.11.1 Enabling SSM

To switch on the SSM mode, follow the next.

STEP	ACTION
1	To switch the SSM on, the following command is required: `SET-SSM:::CTAG::ON;`
2	Verify if the SSM is enabled with the following TL1 command: `RTRV-EQPT-THC:::CTAG;`

3	Check that it is written **SSM=ON**:
	
	`SID DATE TIME`
	`M CTAG COMPLD`
	`"OK:MODE=AUTO/MAN/FHLDVR,MAN_INPUT=IL-1-1…IL-1-4,`
	`ACT_INPUT=IL-1-1…IL-1-4,SSM=ON"`
	`;`

Procedure 7-19 Enabling SSM Configuration

7.2.11.2 Forcing a SSM Quality Level on an Input Line

To force a quality on an available Input Line use the following procedure:

STEP	ACTION

1	To force an SSM quality level, use the following command and choose the quality required among the different possibilities:
	
	`ED-EQPT-IL::1-1/1-2/1-3/1-4:CTAG::`
	`FRCD=PRC/SSU_A/SSU_B/SEC/DNU/NONE;`

2	Check the quality configured with the following command: `RTRV-EQPT-IL::1-1/1-2/1-3/1-4:CTAG;`

3	Check the value written after the “FRCD=”:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "input_line:OK,ENABLED/DISABLED/MONITORED,`
	`PRC/SSU_A/SSU_B/SEC/DNU/NONE/FAILED/DISABLED:`
	`INPUT=FREQ_connector,`
	`ADM_STATE=ENABLED/DISABLED/MONITORED,`
	`TERM=TERMINATED,`
	`CODE=B8ZS/AMI,`
	`WTR=1..12/DISABLED,`
	`FRCD=PRC/SSU_A/SSU_B/SEC/DNU/NONE,`
	`OOF_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`CRC4_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`BPV_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2,`
	`SA4=OFF/ON/SSM,SA5=OFF/ON/SSM,SA6=OFF/ON/SSM,`
	`SA7=OFF/ON/SSM,SA8=OFF/ON/SSM,FREQ=the frequency fed",`
	`TAG=\”My Input Line Tag\”"`
	`;`

Procedure 7-20 Forcing SSM Quality Level on Input Line

7.2.11.3 Forcing a SSM Quality Level on GPS Input

By default the SSU quality is generated when the GPS is locked and DNU when not locked. To force a quality on an available Input Line use the following procedure:

STEP	ACTION
1	To force an SSM quality level, use the following command and choose the quality required among the different possibilities: `ED-EQPT-GPS:::ctag::FRCD=PRC/SSU_A/SSU_B/SEC/DNU;`
2	Check the quality configured with the following command: `RTRV-EQPT-GPS:::MYCTAG;`

3	Check the value written after the "FRCD=":
	
	`      sid   date  time`
	` M    ctag  COMPLD`
	
	`"opstate,ssm:PPS_OFFSET=pps_offset,ADM_STATE=adm_state,`
	`INDOOR=indoor,ELEVATION=elevation,`
	`FRCD=frcd,VISIBLE=visible,TRACKED=tracked"`
	`;`

Procedure 7-21 Forcing SSM Quality Level on GPS input

7.2.11.4 Generate a specific SSM quality on outputs and configuration of the Unknown SSM Quality Translation

When the SSM quality on the input lines is unknown, the 5548C is able to generate a specific SSM quality. The 5548C has also the capability to generate a defined SSM quality.

The following procedure describes how to set these SSM configurations.

STEP	ACTION

1	To force (FRCD) the SSM Quality and to generate a specific SSM quality when the SSM is unknown (UNK) on the input lines, use the following command:
	
	`ED-SSM:::CTAG::UNK=PRC/SSU_A/SSU_B/SEC/DNU/NONE,`
	`FRCD=PRC/SSU_A/SSU_B/SEC/DNU/NONE;`

2	Check the quality configured with the following command: `RTRV-SSM:::CTAG;`
3	Check the values written after the "UNK=" and "FRCD=": `      SID DATE TIME`

	M CTAG COMPLD " HLDVR=PRC/SSU_A/SSU_B/SEC/DNU/NONE, UNK=**PRC/SSU_A/SSU_B/SEC/DNU/NONE**, FRCD=**PRC/SSU_A/SSU_B/SEC/DNU/NONE**" ;

Procedure 7-22 Force SSM quality on outputs and Unknown SSM setting

7.2.11.5 Sa bit configuration on Input Line

To set the Sa bit utilized to to supply SSM to the 5548C, use the following procedure.

STEP	ACTION
1	To force an SSM quality level, use the following command and choose the quality required among the different possibilities: ED-EQPT-IL::1-1/1-2/1-3/1-4:CTAG:: SSM_BIT=**SA4/SA5/SA6/SA7/SA8/NONE**;
2	Check the quality configured with the following command: RTRV-EQPT-IL::**1-1/1-2/1-3/1-4**:CTAG;
3	Check the value written after the “FRCD=”: SID DATE TIME M CTAG COMPLD "input_line:OK,ENABLED/DISABLED/MONITORED, PRC/SSU_A/SSU_B/SEC/DNU/NONE/FAILED/DISABLED: INPUT=FREQ_connector, ADM_STATE=ENABLED/DISABLED/MONITORED, TERM=TERMINATED, CODE=B8ZS/AMI, WTR=1..12/DISABLED, FRCD=**PRC/SSU_A/SSU_B/SEC/DNU/NONE**, OOF_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2, CRC4_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2, BPV_DETECTION=DISDABLED/ENABLED/10-4/10-3/10-2, SA4=**OFF/ON/SSM**,SA5=**OFF/ON/SSM**,SA6=**OFF/ON/SSM**, SA7=**OFF/ON/SSM**,SA8=**OFF/ON/SSM**,FREQ=the frequency fed", TAG=\”My Input Line Tag\”" ;

Procedure 7-23 Sa bit Configuration on Input

7.2.11.6 Sa bit configuration on Output Lines

To set the Sa bit required to supply the SSM on output, use the following procedure.

STEP	ACTION

1	Configure one of the Sa bit (SA4 to SA8) as SSM in one of the two E1 options (E1-1 or E1-2)
	
	`ED-EQPT-SGE::E1-1/E1-2:CTAG::`
	`SA4=OFF/ON/SSM,SA5=OFF/ON/SSM,SA6=OFF/ON/SSM,`
	`SA7=OFF/ON/SSM,SA8=OFF/ON/SSM;`

2	Check the quality configured with the following command: `RTRV-EQPT-SGE::E1-1/E1-2:CTAG;`

3	Check the value written after the "SA**X**=":
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "E1-1/E1-2:CODE=HDB3/AMI,CRC4=ON/OFF,TS16=CCS/CAS,`
	`SA4=OFF/ON/SSM,SA5=OFF/ON/SSM,SA6=OFF/ON/SSM,`
	`SA7=OFF/ON/SSM,SA8=OFF/ON/SSM,IDLE=0…255"`
	`;`

4	Select the E1 configuration option (TYPE) to the Output Group (OG) required. `ED-EQPT-OG::1-1…3-2:CTAG::TYPE=E1_1/E1_2;`
5	Retrieve the E1 configuration option with the following command. `RTRV-EQPT-OG::1-1…3-2:CTAG;`

6	Check the value written after the "TYPE=":
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "1-1…3-2:TYPE=E1_1,E1_2"`
	`;`

Procedure 7-24 Sa bit configuration on Output Line

7.2.12 Restoring Factory Parameters

Should you need to restore the factory default parameters, the following procedure is required.

***Note*:**

When sending the following command the card's function will be stopped during a few seconds and will affect the synchronization distribution if it is not 1:1 protected.

CAUTION:

Serious outage can result if the default setting is reverted on an active card as it will lost its current configuration.

STEP	ACTION
1	Locate the card that you need to restore the factory settings
2	Send the following command accordingly: `INIT-SYS::INC-1-A..INC-1-B/GPS-A/GPS-B/THC-A/THC-B/SGC-A/SGC-B/OUC-1-A..OUC-3-B/MAC-A/ALL:CTAG::COLD;`

Procedure 7-25 Restoring Factory Parameters

7.3 Test and Verification Procedure

CAUTION:

This section can be performed only before placing the shelf in service as it can create outages while shelf is in service.

7.3.1 Introduction

7.3.1.1 Overview

This chapter presents some basic testing and checking procedure which can be used to check that the OSA 5548C SSU is working properly after installation and configuration completion.

7.3.1.2 Requirements

The shelf must have completed its starting procedure, which means that the THC cards must be operational (i.e. not in warm-up or in fast start-up). The configuration shall be already completed, but it is not mandatory.

7.3.2 Serial Connection Test Procedure

STEP	ACTION
1	Write the following command in the bottom of the right window which has appeared once you have been connected: `RTRV-HDR:::CTAG;`

2	Then if the communication is working correctly, you should be prompted with the following answer:
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`;`

3	Redo the same test on the second serial RS-232C connector (one is located on the POWER-B card and the other on the Management connector tile)

Procedure 7-26 Serial Connection Test

7.3.3 Ethernet Connection Test Procedure

STEP	ACTION
1	Start the SyncTerminal
2	If you were not able to communicate until now, despite you followed the correct Ethernet connection procedure, read the follow below information: • If the IP address is already configured in the SyncTerminal: Go in the menu TOOLS > Ping Current Connection, then check that the IP address answers • If the IP address is not yet configured in the SyncTerminal: Go in the menu TOOLS > Ping Specific Address > Enter the IP address, then check that the IP address answers If the connection cannot be established by the PING, check that the 10 or 100 Base-T Ethernet cable is OK and well connected. If the problem persists, contact an IT person to check that the network connection corresponds to the network rules.
3	If it is possibe to establish the communication, send the following command: `RTRV-HDR:::CTAG;`

4	The SyncTerminal should show you the following message:
	`   SID DATE TIME`
	`M  CTAG COMPLD`
	`;`

Procedure 7-27 Ethernet Connection Test

7.3.4 Verifying Shelf Inventory

STEP	ACTION
1	Enter the following TL1 command in one single line to retrieve the OSA 5548C type information: `RTRV-NETYPE:::CTAG;`

2	Then the SyncTerminal should prompts the following answer
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "VENDOR,MODEL,TYPE,RELEASE"`
	`;`

3	To retrieve the serial number of the shelf, send the following command: `RTRV-INV-SYS:::CTAG;`

4	You should receive the following answer:
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "SERIAL NUMBER,SHELF TYPE"`
	`;`

5	To retrieve the inventory of all cards, send the following command: `RTRV-INV::ALL:CTAG;`

6	The SyncTerminal will respond with the following answer:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "card:slot_number,article_number,serial_number,`
	`clei_number,eci_number,hardware_version,`
	`software_version,testing_date,last_upgrade_date"`
	`;`

Procedure 7-28 Verifying Shelf Inventory

7.3.5 Verifying the Shelf Operation Mode

With the procedure below, the user can check the shelf type configured.

STEP	ACTION
1	Look at the MAC card and check it lights the corresponding LED according to the shelf type: • MST for a MASTER shelf • EXP for an Expension shelf

2	To check via software, send the following command:
	`RTRV-EQPT-MAC:::CTAG;`
	
	The shelf will answer the following:
	
	`   SID DATE TIME`
	`M  CTAG COMPLD`
	`   "OK:BUZZER=OFF/CR/MJ/MN,ACO=1/2/BOTH/NONE,`
	`ALMESC=0/6..24,SYS_MODE=INV/MST/EXP"`
	`;`
	The SYS_MODE parameter is the shelf operation mode, the INV means "INVALID". The EXP means Expansion Shelf. The MST means MASTER shelf (by default).
	
	If the shelf operation mode is wrong, it is mandatory to power-off the shelf to change the configuration with the rotary switch located on the Management tile.

Procedure 7-29 Verifying the Shelf Operation Mode

7.3.6 LEDs Operation Test Procedure

Below is a LAMP test procedure to be done physically on the shelf and via software.

STEP	ACTION
1	Push the switch labeled "LAMP TEST" on the POWER A card and check that: • The test lasts about 10 seconds • All LEDs have lit during all the test duration • The bicolor LEDs have been RED during 5 seconds and then GREEN during the remaining 5 seconds
2	Do the same observation after sending the following TL1 command: `OPR-LEDS:::CTAG;`

Procedure 7-30 LEDs Operation Test

7.3.7 Input Line Priority Configuration Testing Procedure

This procedure tests if the priority configuration and selection works correctly

STEP	ACTION
1	Check the current priority setting with the following TL1 command: `RTRV-PRIO:::CTAG;`

2	The response is formatted such as below:
	
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`   "IL-1-1=1..5,IL-1-2=1..5,IL-1-3=1..5,IL-1-4=1..5,`
	`GPS=1..5 "`
	`;`

3	Take note of the current priority configuration

4	Disable one by one the input line starting from the highest priority to the lowest one with the following command:
	
	`ED-EQPT-IL::IL-1-1/IL-1-2/IL-1-3/IL-1-4/GPS:`
	`CTAG::ADM_STATE=DISABLED;`

5	After each input line disabled, check that the active THC card shows the line number corresponding to the line with the next lower priority than the one just disabled. 1 to 4 on the THC corresponds to IL-1-1 to IL-1-4 and G corresponds to GPS Note: If the new selected line has a WTR time configured, wait until that the delays has elapsed or initialize the WTR with the following TL1 command before disabling the next input line. `INIT-WTR::1-1/1-2/1-3/1-4:CTAG;`

6	Enable the lines to restore them as per their initial configuration status:
	
	`ED-EQPT-IL::IL-1-1/IL-1-2/IL-1-3/IL-1-4/GPS:`
	`CTAG::ADM_STATE=ENABLED;`

Procedure 7-31 Input Line Priority Configuration Test

7.3.8 Redundant Card (Stand-by) Test Procedure

When there are two cards in the INC group, in the GPS group or in the THC group, one of the cards is in active mode and the second in stand-by.

Follow the below procedure to test if the stand-by card is working properly.

STEP	ACTION
1	Send the following TL1 command selecting the group you want to swap the cards: `SW-DX::`**`INC-1/GPS/THC/MAC`**`:CTAG;`

2	Verify that you have received an autonomous message such as below:
	
	`      SID DATE TIME`
	`A     ATAG REPT SW`
	`   "`**`new active card,previous active card`**`"`
	`;`

3	You should see on the shelf that the new active card is working like the same status as the previous active one. Just allow sometime to the THC card to complete its stating sequence.
4	Once the test done, reconfigure the A card as the active one with the same command: `SW-DX::`**`INC-1/GPS/THC/MAC`**`:CTAG;`

Procedure 7-32 Redundant Card (stand-by) Test

7.3.9 Testing Alarm Levels

This section is the procedure to test each alarm level such as Minor, Major and Critical.

7.3.9.1 Minor Alarm (MN)

STEP	ACTION

1	Enable an input line to a port which is not connected with an input reference signal or set a wrong input signal type, with the following command:
	`ED-EQPT-IL::1-1/1-2/1-3/1-4:CTAG::`
	`INPUT=E1_1/E1_2/E1_3/E1_4/FREQ_1/FREQ_2/FREQ_3/FREQ_4,`
	`ADM_STATE=ENABLED;`
	
	It is also possible to remove or deactivate an input signal

2	Check that the MAC card shows a Minor alarm (MN)
3	Check that the minor alarm is reported after sending the following command: `RTRV-ALM::ALL:CTAG;`

Procedure 7-33 Minor Alarm (MN) Test

7.3.9.2 Major Alarm (MJ)

STEP	ACTION
1	Remove any card from its slot
2	Check that the MAC card shows a Major alarm (MJ)
3	Check that the major alarm is reported after sending the following command: `RTRV-ALM::ALL:CTAG;`

Procedure 7-34 Major Alarm (MJ) Test

7.3.9.3 Critical Alarm (CR)

STEP	ACTION
1	Remove a protected pair of cards from its slot or leave a group of card (e.g INC) empty.
2	Check that the MAC card shows a Critical alarm (CR)
3	Check that the critical alarm is reported after sending the following command: `RTRV-ALM::ALL:CTAG;`

Procedure 7-35 Critical Alarm (CR) Test

7.3.10 Testing Output Ports

7.3.10.1 Testing E1 Output

An oscilloscope with a test load impedance of 75 Ω (± 5%) or 120 Ω (± 5%), depending on the Output tile, is necessary to execute the following test. Then connect the oscilloscope input to a provisioned output E1 port and verify the following information.

Output Tile	CEI connectors or BNC Remote panel	With Sub-D connectors or with CEI/BNC connected with Balun (75Ω to 120Ω adapter)
Cable type	Asymmetrical	Symmetrical
Test load impedance	75 ohms	120 ohms
Nominal peak voltage of a pulse	2.37 V	3 V
Unit Interval (UI) width	488.28 ns	
Ratio of the amplitudes of positive and negative pulses at the centre of the pulse interval	0.95 to 1.05	
Ratio of the widths of positive and negative pulses at the nominal half amplitude	0.95 to 1.05	
Pulse shape	Rectangular	

An isolated pulse shall fit the template shown in the Figure 7-1 : E1 Pulse Template. The negative pulse is the upside-down representation of the following Figure.

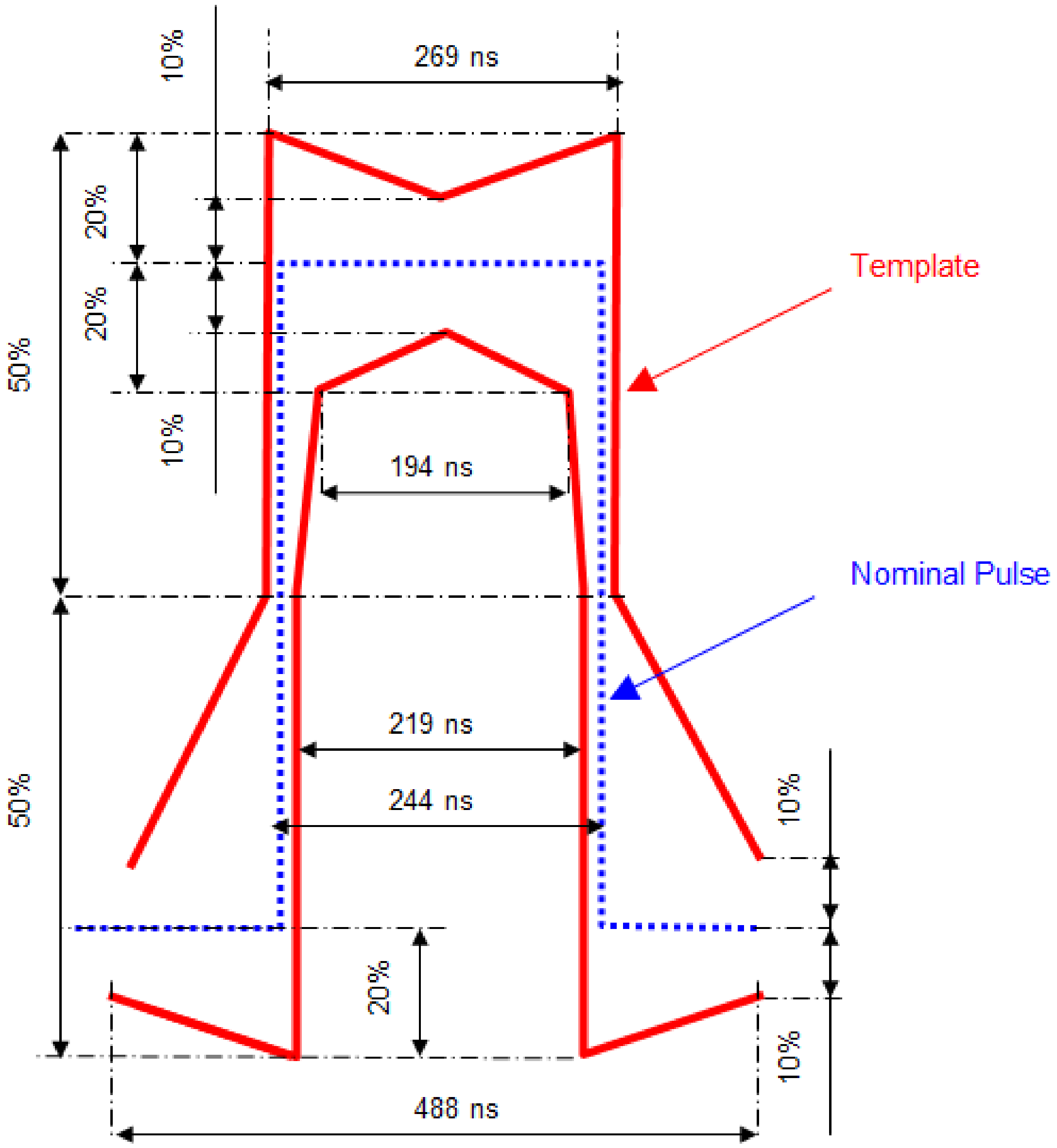


Figure 7-1 : E1 Pulse Template

7.3.10.2 Testing Frequency Output

An oscilloscope with a test load impedance of 75 Ω (± 5%) or 120 Ω (± 5%) depending on the Output Tile is necessary to test a Frequency Output Line. Then connect the oscilloscope input to a provisioned Frequency output port and verify the following information.

Frequency	2048 kHz ± 50 ppm	
Pulse shape	The signal must conform with the mask (Figure 7-2) The value V corresponds to the maximum peak value The value V1 corresponds to the minimum peak value	
Output Tile	CEI connectors or BNC Remote panel	With Sub-D connectors or with CEI/BNC connected with Balun (75Ω to 120Ω adapter)
Cable type	Asymmetrical	Symmetrical
Test load impedance	75 ohms	120 ohms
Maximum peak voltage (Vop)	1.5	1.9
Minimum peak voltage (Vop)	0.75	1.0

An isolated pulse shall be shown, as in the following Figure. An isolated pulse is defined as a pulse preceded by a bipolar violation, followed by a sequence of 3 negatives and 3 positives pulses and ended by a bipolar violation (two consecutives intervals at the same value).

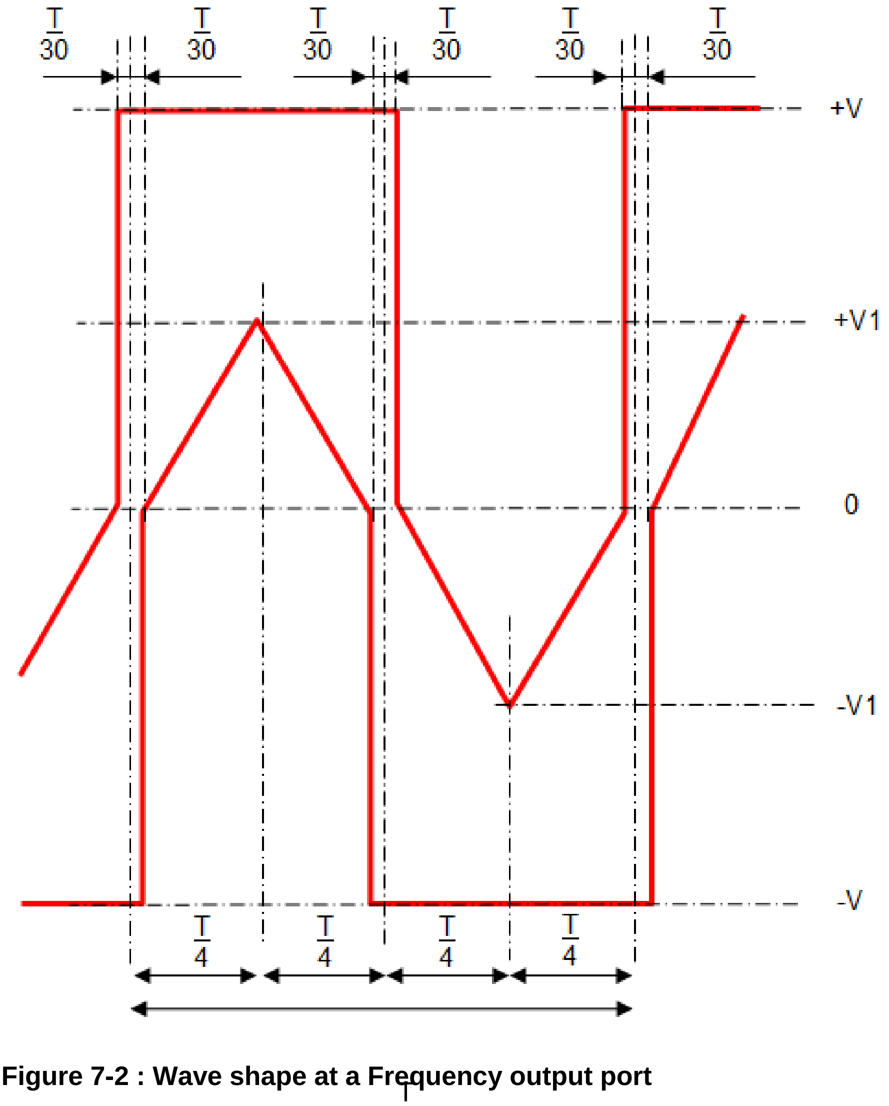


Figure 7-2 : Wave shape at a Frequency output port

7.3.10.3 Testing NTP Output

STEP	ACTION Server card
1	Set up the server card network parameters refer to section 7.2.2.5.
2	Change your computer time
3	Use a program to synchronize the computer time to the NTP server card (stratum 1) (Yats 32)
4	Verify the synchronization

Procedure 7-36 NTP Output Test

7.3.10.4 Testing PTP Output

<table>
<tr><th>STEP</th><th>ACTION Server card</th></tr>
<tr><td>1</td><td>Set up the IP settings for PTP port (IP address, mask, gateway)</td></tr>
<tr><td>2</td><td>Configure the same PTP domain in the TCC-PTP (Grandmaster) and in the slave (for example OSA 5320).</td></tr>
<tr><td>3</td><td>Configure the TCC-PTP addressing mode respectively as MIXED or UNICAST</td></tr>
<tr><td>4</td><td>Configure the slave addressing mode respectively as MULTICAST or UNICAST</td></tr>
<tr><td>5</td><td>Only for UNICAST : Enter the PTP IP address of TCC-PTP used in the Acceptable Master Table (AMT) of the slave
<table>
<tr><th colspan="7">ACCEPTABLE MASTER TABLE CONFIGURATION (Unicast Delay Modes)</th></tr>
<tr><th></th><th>master's address
xxx.xxx.xxx.xxx</th><th>IEEE EUI-64 port ID
xx-xx-xx-xx-xx-xx-xx-xx</th><th>PTP Port
number</th><th>priority
1</th><th>priority
2</th><th>request
unicast Announce</th></tr>
<tr><td>1</td><td>149.133.40.191</td><td>FF-FF-FF-FF-FF-FF-FF-FF</td><td>65535</td><td>10</td><td>10</td><td>YES</td></tr>
<tr><td>2</td><td>149.133.40.159</td><td>FF-FF-FF-FF-FF-FF-FF-FF</td><td>65535</td><td>90</td><td>90</td><td>YES</td></tr>
<tr><td>3</td><td>0.0.0.0</td><td>00-00-00-00-00-00-00-00</td><td>0</td><td>0</td><td>0</td><td>NO</td></tr>
</table></td></tr>
<tr><td>6</td><td>Verify that one master is visible in the slave PTP Status page and that the Master address corresponds to the one previously configured

PTP OVER
Masters Visible: 1
Master Address: 149.133.40.159
Master State: Running</td></tr>
</table>

Procedure 7-x PTP Output Test

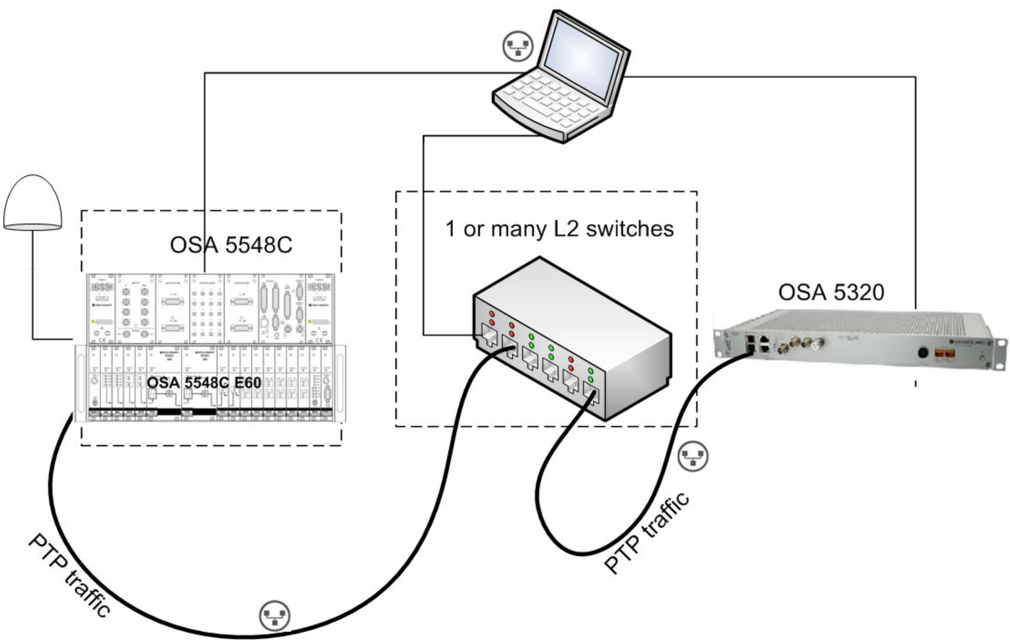


Figure 7-3 : PTP set-up testing

7.3.11 Commissioning Completion

7.3.11.1 Alarm and History Flushing

Prior to complete commissioning, it is recommended to flush all logs related to commissioning procedure.

STEP	ACTION
1	Check current Active alarms with the following command: `RTRV-ALM::ALL:CTAG;`
2	If no alarm is answered, go to the next step, if there is alarms like "IMPROPER REMOVAL, send the following command to the empty slots: `DLT-EQPT::INC-1-A/INC-1-B/GPS-A/GPS-B/THC-A/THC-B/SGC-A/SGC-B/OUC-1-A..OUC-3-B/MAC-A:CTAG;` If there is any other alarm, refer to section 0 for troubleshooting. And resend the command `RTRV-ALM::ALL:CTAG;` for verification.
3	Flush the Alarm History with this command: `INIT-ALM-HIST:::CTAG;`

4	Check that history is empty with this command:
	`RTRV-ALM-HIST:::CTAG::;`
	
	The answer should be such as follow:
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`;`

5	Flush the Automatic Message with this command: `INIT-AO::ALL:CTAG;`

6	Check that Automatic Messages are empty with this command:
	`RTRV-AO:::CTAG::;`
	
	The answer should be such as follow:
	`      SID DATE TIME`
	`M     CTAG COMPLD`
	`  /* */`
	`;`

Procedure 7-37 Alarm and History Flushing

7.3.11.2 Last Verification

If installation and commissioning have been successfully performed, you should not see any alarms, except those expected (i.e. due to the pre-configuration).

7.3.11.3 End of Commissioning Check List

In order to verify that all the basic points related to the commissioning have been executed, please read the following table.

Item	Tasks	Done
1	The Installation check list in section 4.8 has been duly followed	☐
2	The serial and/or remote communication has been successfully established. (see section 7.2.2)	☐
3	General configuration has been made with the shelf name the date and the time and empty slots disabled. (see section 7.2.6)	☐
4	Input lines have been configured (ports attribution, E1 configuration, WTR,…). (see section 7.2.7)	☐
5	The selection mode has been configured (Automatic, Manual and priorities). (see section 7.2.8)	☐
6	The output configuration has been done (E1 configuration options, Frequency, etc.) (see section 7.2.10)	☐
7	If necessary, the SSM configuration has been set (see section 7.2.11)	☐
8	Both serial and Ethernet connections have been tested (see sections 7.3.2 and 7.3.3)	☐
9	The inventory of the shelf has been checked and eventually noted (see section 7.3.4)	☐
10	The shelf operation mode has been checked (see section 7.3.5)	☐
14	The LEDs have been successfully tested with the LAMP TEST function (see section 7.3.6)	☐
15	The input line priority configuration has been successfully tested (see section 7.3.7)	☐

Item	Tasks	Done
16	The stand-by cards (INC, THC, MAC) have been successfully tested (see section 7.3.8)	☐
17	The alarm levels have been successfully tested (see section 7.3.9)	☐
18	The output ports have been successfully tested (see section 7.3.10)	☐
19	All alarms and events have been flushed (see section 7.3.11)	☐

Table 7-1 End of Commissioning Check List

The commissioning procedure is complete. The OSA 5548C SSU is ready to be placed in service!

Work done	First name, Last Name of the responsible	Date of completion
Installation		
Configuration		
Test		

Location	

Comments	

Chapter

8. Maintenance & Troubleshooting

Including:

- Maintenance
- Troubleshooting
- Cards & Tiles Replacement or Addition
- Fuse Replacement
- Repair & Return
- Oscilloquartz Contact Information

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8.1 Maintenance

The OSA 5548C SSU does not require any routine maintenance. However, in order to ensure correct functioning of the LEDS and the cards operating in stand-by mode, a regular (once a year) preventive maintenance is recommended.

8.1.1 LEDs Test

The following is a LAMP test procedure to be done physically on the shelf and/or via software.

STEP	ACTION
1	Push the switch labeled “LAMP TEST” on the POWER A card and check that: 1. The test lasts about 10 seconds 2. All LEDs have lit during all the test duration 3. The bicolor LEDs have lit in RED during 5 seconds and then GREEN during the remaining 5 seconds
2	Repeat the lamp test after sending the following TL1 command: `OPR-LEDS:::CTAG;`

Procedure 8-1 LEDs Maintenance Test

8.1.2 Stand-by Cards Test

When the shelf has a complete card group, e.g. INC-1-A & INC-1-B, which means that most of the time, the slave card remains in stand-by, it is recommended to check it in order to ensure that it is still working correctly.
For that purpose, use the following procedure.

STEP	ACTION
1	Study the card configuration to check if it contains: • 2x INC card in the same group • 2x GPS card • 2x THC card
2	If you get one or more of the above conditions, you can swap the stand-by card to become active with the following command `SW-DX::INC-1/GPS/THC:CTAG;`
3	Check that the card which has became active is working like the previous one. Allow for THC card settling time.

Procedure 8-2 Stand-by Cards Maintenance Test

8.2 Troubleshooting

The OSA 5548C SSU can report many alarms and event messages to alert the user about any problem. The alarms can be seen on the cards LEDs or in detail with software such as SyncTerminal or SyncView PLUS.

This section guides the user to determine the cause of failure which might happen on the OSA 5548C SSU

8.2.1 Alarm Behavior - Visible on Front LEDs

8.2.1.1 INput Card (INC)

LED	State	Description	
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working	During the power-up sequence, the LED can remain red for a short while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair after a last unsuccessful firmware initialization tentative
	RED Flashing	There is a firmware version error	Download the correct firmware in the card with the command "`ACT-DNLD`" after verified that the firmware is in the MAC card.
	ORANGE	A new card's firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the INC's fuse and replace it if necessary or return the card for repair
IN1…IN4	GREEN	The input line is correctly configured to receive the signal assigned. The signal is qualified. The line is either ENABLED.	No action needed, the line is perfectly configured
IN1…IN4	GREEN Flashing	The line is in Wait-to-restore time and will be	Wait until the WTR time has elapsed or

LED	State	Description	
		recovered once the time elapsed.	initialize it with the command "`INIT-WTR`"
	ORANGE	The line is being MONITORED	The 5548C measures the line built cannot select it as an Input Reference.
	RED	The line is either ENABLED or MONITORED and at least one of the below criteria is detected: <u>With E1 signal:</u> LOS: Loss Of Signal • The signal is lower than -15dB with terminated connection • The signal is lower than -35dB with a bridged connection AIS: Alarm Indication Signal OOF: Out Of Frame • SSM is enabled and frame type is PCM31 • 3 consecutive incorrect FAS words (ITU-T G.706) • If Threshold alarm is enabled: o When false words rate of the total number (4000) during 1s, is higher or equal than the	Check the Input signal connected and if necessary, configure IL parameters with the command "`ED-EQPT-IL`"

LED	State	Description	
		Threshold selected CRC-4 • 915 CRC-4 values or more are false on a total of 1000 (ITU-T G.706) • If Threshold alarm is enabled: o When false CRC-4 values rate of the total number (1000) during 1s, is higher or equal than the Threshold selected BPV : Bipolar Violation (with AMI Code) or CV : Code Violation (with HDB3) • 1 or more BPV or CV detected during an interval of 1s • If Threshold alarm is enabled: o When BPV or CV rate of the total number (2.048E+06) during 1s, is higher or equal than the Threshold selected <u>With Frequency signal:</u> LOS: Loss Of Signal • Signal level is lower than 200mV rms with sine wave • Signal level is lower than 0.6V OOL: Out Of Limit • The frequency is not recognised by	

LED	State	Description	
		the system • Relative Frequency Offset Δf / f > 50ppm	
	RED Flashing	Performance Measurement failure: MTIE error, TDEV error, Ym Error, MTIE and/or TDEV and/or Ym beyond of the specified mask	Check the quality of the input line connected. Modify the Performance threshold if necessary.
	OFF	The disabled and the unused lines have their LED extinguished. Only 4 LEDs can be illuminated on the active INC card. The stand-by INC card remains with all its input LEDs extinguished.	If it is required to use the line, enable and configure it with the command "`ED-EQPT-IL`"

Table 8-1 Input Card Troubleshooting - visible LEDs

8.2.1.2 GPS card (GPS)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a qualified signal	During the power-up sequence, the LED can remain red for a while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	The firmware version installed in the card does not correspond or is outdated compared the rest of the shelf version	Download the correct firmware in the card with the command “ACT-DNLD” after verified that the firmware is in the MAC card.
	ORANGE	A new card’s firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the THC’s fuse and replace it if necessary or return the card for repair
GPS	GREEN	GPS signal is received	No action needed
	GREEN Flashing	The line is in Wait-to-restore time and will be recovered once the time elapsed.	Wait until the WTR time has elapsed or initialize it with the command “`INIT-WTR`”
	ORANGE	The GPS input is being monitored	No action needed. Select the line “enable” to make it available for reference.
	RED	No or not enough GPS signal available. PPS input not available. This state is present during about 5 min after powered-on the card.	1. Check that the GPS antenna has a clear view of the sky and respects the conditions described in section 3.5. 2. Check that a in-line amplifier is mounted if the cable length is longer than 70 meters

LED	State	Description	Action
	RED Flashing	No connection to the antenna. The GPS cable can be shorted or opened. When both GPS and OCXO LEDs are in RED flasing state, this means that the input is ejected due to performance alarm.	When only the GPS LED is flashing: 1. Check that the GPS antenna cable is correctly connected to the antenna, to the EMP arrestor and to the 5548C 2. Check that the EMP capsule is not blown 3. Measure the GPS antenna cable on the antenna side and check that there is about 5 Volts 4. Check the GPS antenna When both GPS and OCXO are flashing: ensure that the threshold set is lower than G.811 requirements as the GPS line is not filtered by the THCs at this point.
	OFF	The GPS input is set as “disable” or the GPS card is in stand-by mode.	If it is required to use the line, enable it.
OCXO	RED	GPS card’s internal oscillator failure. The system has detected a failure on the internal oscillator	The card should be returned to factory for repair.
	RED Flashing	The GPS card is in pre-tracking sequence. This state takes about 200s. When both GPS and OCXO LEDs are in RED flasing state, this means that the input is ejected due to performance alarm.	No action needed When both GPS and OCXO are flashing: ensure that the threshold set is lower than G.811 requirements as the GPS line is not filtered by the THCsat this point.
	OFF	The oscillator is operating correctly. The card can be in stand-by if the GPS LED is als OFF	No action needed.

Table 8-2 GPS Card Troubleshooting - visible LEDs

8.2.1.3 GNSS card (GLN)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a qualified signal	During the power-up sequence, the LED can remain red for a while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	The firmware version installed in the card does not correspond or is outdated compared the rest of the shelf version	Download the correct firmware in the card with the command “ACT-DNLD” after verified that the firmware is in the MAC card.
	YELLOW	A new card’s firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the GPS’s fuse and replace it if necessary or return the card for repair
GNSS	GREEN	GPS and/or Glonass signal is received	No action needed
	GREEN Flashing	The line is in Wait-to-restore time and will be recovered once the time elapsed.	Wait until the WTR time has elapsed or initialize it with the command “`INIT-WTR`”
	YELLOW	The GNSS input is being monitored	No action needed. Select the line “enable” to make it available for reference.
	RED	No or not enough GPS signal available. PPS input not available. This state is present during about 5 min after powered-on the card.	1. Check that the GNSS antenna has a clear view of the sky and respects the conditions described in section 3.5 and in the GNSS installations documentation. 2. Check that a in-line amplifier is mounted if the cable length is longer than 70 meters (loss depend of cable used)

LED	State	Description	Action
	RED Flashing	No connection to the antenna. The GNSS cable can be shorted or opened. When both GNSS and XO LEDs are in RED flashing state, this means that the input is ejected due to performance alarm.	When only the GNSS LED is flashing: 1. Check that the GNSS antenna cable is correctly connected to the antenna, to the EMP arrestor and to the 5548C 2. Check that the EMP capsule is not blown. 3. Measure the GNSS antenna cable on the antenna side and check that there is about 5 Volts 4. Check the GNSS antenna When both GNSS and XO are flashing: ensure that the threshold set is lower than G.811 requirements as the GPS line is not filtered by the THCs at this point.
	OFF	The GNSS input is set as "disable" or the GNSS card is in stand-by mode.	If it is required to use the line, enable it.
OCXO	RED	GNSS card's internal oscillator failure. The system has detected a failure on the internal oscillator	The card should be returned to factory for repair.
	RED Flashing	The GNSS card is in pre-tracking sequence. This state takes about 200s. When both GNSS and XO LEDs are in RED flashing state, this means that the input is ejected due to performance alarm.	No action needed When both GNSS and XO are flashing: ensure that the threshold set is lower than G.811 requirements as the GNSS line is not filtered by the THC sat this point.
	OFF	The oscillator is operating correctly. The card can be in stand-by if the GNSS LED is als OFF	No action needed.

Table 8-3 GNSS Card Troubleshooting - visible LEDs

8.2.1.4 Tracking & Holdover Card (THC)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a qualified signal	During the power-up sequence, the LED can remain red for a while depending on the internal oscillator. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	The firmware version installed in the card does not correspond or is outdated compared the rest of the shelf version	Download the correct firmware in the card with the command “ACT-DNLD” after verified that the firmware is in the MAC card.
	ORANGE	A new card’s firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the THC’s fuse and replace it if necessary or return the card for repair
HOLDOVER	RED	FREE RUN condition if after the warmup mode, the OSA 5548C is not connected to input reference signal HOLDOVER condition when the OSA 5548C has lost all its input references	If this situation was expected, no action are needed, otherwise, follow the next: 1. Check that the INC cards are plugged properly 2. Verify that the INC cards have no alarms 3. Verify that at least one input reference is connected and configured correctly 4. Verify the revertive mode (if a line has been lost in non-revertive mode, it will not been reselected) 5. Control that no lines are being in Wait-To-Restore time mode 6. If the SSM mode is enabled, control that the input reference DS1 got an higher quality level than the one configured for the holdover mode
HOLDOVER	RED Flashing	FAST-START, before entering in normal	No action needed. Usually this status

LED	State	Description	Action
		operation, fast tracking mode is used to quickly reduce the frequency offset between internal oscillator and input reference	remains approximately 1 minute.
	OFF	The system is correctly driven by the input reference with to the bandwidth specified	No action needed, except if the STATUS LED is extinguished.
OSCILLATOR	RED	OSCILLATOR FAILURE, the system has detected a failure on the internal oscillator	The active THC should have switched on the second one if 1:1 protected hence, the THC card should be returned for repair after a last unsuccessful firmware initialization.
	RED Flashing	WARM-UP, the THC is in warm-up condition during the oscillator's heating period – after Power on	No action needed
	OFF	The Oscillator has reached its normal operating temperature	No action needed, except if the STATUS LED is extinguished.

Table 8-4 Tracking Holdover Card Troubleshooting - visible LEDs

8.2.1.5 Signal Generator Card

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a valid signal	During the power-up sequence, the LED can remain red for a short while. If the LED stay in this status longer, it means that the card is defective and should be returned for repair after a last unsuccessful firmware initialization tentative
	RED Flashing	There is a firmware version error	Download the correct firmware in the card with the command "`ACT-DNLD`" after verified that the firmware is in the MAC card.
STATUS	ORANGE	A new card's firmware is being downloaded	No action needed

LED	State	Description	Action
	OFF	Dead, no power is supplied to the card	Test the SGC's fuse and replace it if necessary or return the card for repair
E1	GREEN	The E1 signal function and distribution are working correctly	No action needed
	GREEN Flashing	The 5548C is in Pass-through mode	Check the THC cards operation states.
	RED	Alarm on at least one of the E1 signal distributed by the SGC card.	The SGC may be in trouble and should be returned for repair after a last unsuccessful firmware initialization
	RED Flashing	No reference is fed to the SGC to generate E1 signal	Check the upstream cards operation (THC and INC)
	OFF	Dead, no power is supplied to the card	The SGC may be in trouble and should be returned for repair after a last unsuccessful firmware initialization
f	GREEN	The Frequency and PPS signal function and distribution are working correctly	No action needed
	GREEN Flashing	The 5548C is in Pass-through mode	Check the THC cards operation states.
	RED	Alarm on at least one of the Frequency and/or PPS signals distributed by the SGC card	The SGC may be in trouble and should be returned for repair after a last unsuccessful firmware initialization
	RED Flashing	No reference is fed to the SGC to generate Frequency and/or PPS signal	Check the upstream cards operation (THC and INC)
	OFF	Dead, no power is supplied to the card	The SGC may be in trouble and should be returned for repair after a last unsuccessful firmware initialization

Table 8-5 SCard Troubleshooting - visible LEDs

8.2.1.6 OUtput Card (OUC)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a valid signal	During the power-up sequence, the LED can remain red for a short while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	There is a firmware version error	Download the correct firmware in the card with the command “`ACT-DNLD`” after verified that the firmware is in the MAC card.
	ORANGE	A new card’s firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the OUC’s fuse and replace it if necessary or return the card for repair
OUT 1-10 E1	GREEN	The function is working and the E1 signals are distributed correctly	No action needed
	RED	An alarm has been detected on at least one of the 10 outputs 1 to 10	1. Verify that the output lines connected are not shorted if you have enabled this alarm detection 2. Measure each output ports and check that the level and shape are correct 3. If the card is protected (1:1) and the second card does not show any alarm, it is recommended to return this card for repair
	RED Flashing	No E1 signal is received, to be processed and distributed by the OUC card	During the turn-up procedure, it is normal to get such alarm until the shelf is able to provide

LED	State	Description	Action
			a valid signal to the OUC cards. However, if this status remains longer, follow this procedure: 1. Verify the SGC cards operation and configuration 2. Verify the THC cards operation and configuration 3. Verify the INC cards operation and configuration 4. Verify the input lines configuration 5. Verify the input ports cabling
	OFF	The output line group is not configured as E1 or no output tile is installed if the f LED is also OFF	If the description does not correspond to the behavior currently shown by the shelf, follow the next: 1. Verify that output configuration is correct 2. Verify that Output Tile is present 3.
OUT 1-10 f	GREEN	The function is working and the Frequency signals are distributed correctly	No action needed
	RED	An alarm has been detected on at least one of the 10 outputs 1 to 10	1. Verify that the output lines connected are not shorted if you have enabled this alarm detection 2. Measure each output ports and check that the level and shape are correct 3. If the card is protected (1:1) and the second card does not show any alarm, it is recommended to return this card for repair

LED	State	Description	Action
OUT 1-10 f	RED Flashing	No Frequency signal is received, to be processed and distributed by the OUC card	During the turn-up procedure, it is normal to get such alarm until the shelf is able to provide a valid signal to the OUC cards. However, if this status remains longer, follow this procedure: 1. Verify the SGC cards operation and configuration 2. Verify the THC cards operation and configuration 3. Verify the INC cards operation and configuration 4. Verify the input lines configuration 5. Verify the input ports cabling
	OFF	The output line group is not configured as Frequency or no output tile is installed if the E1 LED is also OFF	If the description does not correspond to the behavior currently shown by the shelf, follow the next: 1. Verify that output configuration is correct 2. Verify that Output Tile is present
OUT 11-20 E1	GREEN	The function is working and the E1 signals are distributed correctly	No action needed
	RED	An alarm has been detected on at least one of the 10 outputs 11 to 20	1. Verify that the output lines connected are not shorted if you have enabled this alarm detection 2. Measure each output ports and check that the level and shape are correct 3. If the card is protected (1:1) and the second card does not show any alarm, it is recommended to return this card for repair

LED	State	Description	Action
OUT 11-20 E1	RED Flashing	No E1 signal is received, to be processed and distributed by the OUC card	During the turn-up procedure, it is normal to get such alarm until the shelf is able to provide a valid signal to the OUC cards. However, if this status remains longer, follow this procedure: 1. Verify the SGC cards operation and configuration 2. Verify the THC cards operation and configuration 3. Verify the INC cards operation and configuration 4. Verify the input lines configuration 5. Verify the input ports cabling
	OFF	The output line group is not configured as E1 or no output tile is installed if the f LED is also OFF	If the description does not correspond to the behavior currently shown by the shelf, follow the next: 1. Verify that output configuration is correct 2. Verify that Output Tile is present
OUT 11-20 f	GREEN	The function is working and the Frequency signals are distributed correctly	No action needed
	RED	An alarm has been detected on at least one of the 10 outputs 11 to 20	1. Verify that the output lines connected are not shorted if you have enabled this alarm detection 2. Measure each output ports and check that the level and shape are correct 3. If the card is protected (1:1) and the second card does not show any alarm, it is recommended to return this card for repair

LED	State	Description	Action
OUT 11-20 f	RED Flashing	No Frequency signal is received, to be processed and distributed by the OUC card	During the turn-up procedure, it is normal to get such alarm until the shelf is able to provide a valid signal to the OUC cards. However, if this status remains longer, follow this procedure: 1. Verify the SGC cards operation and configuration 2. Verify the THC cards operation and configuration 3. Verify the INC cards operation and configuration 4. Verify the input lines configuration 5. Verify the input ports cabling
	OFF	The output line group is not configured as Frequency or no output tile is installed if the E1 LED is also OFF	If the description does not correspond to the behavior currently shown by the shelf, follow the next: 1. Verify that output configuration is correct 2. Verify that Output Tile is present

Table 8-6 OUtput Card Troubleshooting - visible LEDs

8.2.1.7 Time Code Card (TCC-NTP)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a valid signal	During the power-up sequence, the LED can remain red for a short while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	There is a firmware version error	Download the correct firmware in the card with the command “`ACT-DNLD`” after verified that the firmware is in the MAC card.
	ORANGE	A new card’s firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the OUC’s fuse and replace it if necessary or return the card for repair
NTP SYNC	RED	The card system is currently in power up mode, wait TOD UTC GPS or server failure.	Check the server availability, check if the GPS card is working fine.
	RED Flashing	Waiting synchronization, TOD UTC GPS not already received.	No action needed
	GREEN	The card is working correctly	No action needed
	GREEN Flashing	TOD UTC GPS lose, NTP is waiting locked.	Check the GPS card
	ORANGE	A new card’s firmware is being downloaded	No action needed
ETHERNET	GREEN	Ethernet cable connected	No action needed
	OFF	Etthernet cable disconnected	Connect the RJ45 cable

Table 8-7 Time Code Card NTP Troubleshooting - visible LEDs

Note:

The following procedure is shown when a valid and well NTP server and RJ45 cable is connected to the related input connector.

Seq.	STATUS	NTP Sync	Ethernet	DESCRIPTION
1	RED	OFF	OFF	Initialization
2	RED	RED flashing	OFF	Initialization
3	RED	RED flashing	GREEN	RJ45 cable connected
4	GREEN	RED flashing	GREEN	Waiting synchronization, TOD UTC GPS received or valid NTP server available.
5	GREEN	RED	GREEN	No GPS TOD received, check GPS card
6	GREEN	GREEN:	GREEN	NTP worked properly

Table 8-8 Time Code Card NTPTurn-up Status

8.2.1.8 Time Code Card (TCC-PTP)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	RED	The card is currently not working or not delivering a valid signal	During the power-up sequence, the LED can remain red for a short while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	There is a firmware version error	Download the correct firmware in the card with the command “`ACT-DNLD`” after verified that the firmware is in the MAC card.
	ORANGE	A new card’s firmware is being downloaded	No action needed
	OFF	Dead, no power is supplied to the card	Test the TCC-PTP’s fuse and replace it if necessary or return the card for repair
PTP SYNC	RED	The card system is currently in power up mode waiting for ToD/PPS signals and checking the validity signals from SGC cards. TCC-PTP alarms: No Clock Input, No TOD Input, Time Not TAI	Check the server availability, check if the GPS card and THC card are working fine.
	RED Flashing	Waiting synchronization, TOD UTC GPS and signals from THC not already received. TCC-PTP alarms: No Clock Input, No TOD Input, Time Not TAI	No action needed
	GREEN	The card is working correctly	No action needed
	GREEN Flashing	TOD UTC GPS and/or THC signals lose, PTP is waiting locked.	Check the GPS card
	ORANGE	A new card’s firmware is being downloaded	No action needed
ETHERNET	GREEN	Ethernet cable connected	No action needed
	OFF	Ethernet cable disconnected	Connect the RJ45/SFP cable

Table 8-9 Time Code Card PTP Troubleshooting - visible LEDs

Note:

The following procedure is shown when a valid and well PTP server and RJ45 / SFP cable is connected to the related input connector.

Seq.	STATUS	PTP Sync	Ethernet	DESCRIPTION
1	RED	OFF	OFF	Initialization
2	RED	RED flashing	OFF	Initialization
3	RED	RED flashing	GREEN	RJ45/ SFP cable connected
4	GREEN	RED flashing	GREEN	Waiting synchronization, TOD UTC GPS received or valid PTP server available.
5	GREEN	RED	GREEN	No GPS TOD received, check GPS card
6	GREEN	GREEN:	GREEN	PTP worked properly

Table 8-10 Time Code Card PTP Turn-up Status

8.2.1.9 MAnagement Card (MAC)

LED	State	Description	Action
STATUS	GREEN	The card is working correctly	No action needed
	GREEN Flashing	The card is being initialized	This status is normal at the start-up. If it remains permanent after 3 minutes, follow this procedure: 1. Plug-out and reinsert the MAC card. 2. If the previous action did not recover the card, return it for repair
STATUS	RED	The card is defective	During the power-up sequence, the LED can remain red for a short while. If the LED stays in this status longer, it means that the card is defective and should be returned for repair.
	RED Flashing	The firmware version installed in the card does not correspond or is outdated compared the rest of the shelf version.	Download the correct firmware in the card with the command "`ACT-DNLD`" after verified that the firmware is in the MAC card.
	ORANGE	A new card's firmware is being downloaded	No action needed
	ORANGE Flashing	The MST LED should also blink in GREEN. It means that the MAC internal flash memory is corrupted.	Please contact Oscilloquartz for technical support.
	OFF	Dead, no power is supplied to the card	Test the MAC's fuse and replace it if necessary or return the card for repair
MST	GREEN	The 5548C is a master shelf	No action needed
	GREEN Flashing	The master shelf is being started. Or when the STATUS LED is orange and Flashing, the internal MAC flash memory is corrupted. Or when RMT & EXP LEDs are Flashing together with the MST, the network	No action needed, the 5548C is starting as starting as a master shelf. If internal flash memory is corrupted, contact Oscilloquartz for support. If network parameters have not been found, insert the POWER B card or send it for repair

LED	State	Description	Action
		parameters have not been found in the POWER B card.	after a last plug-in/out manipulation.
	OFF	The 5548C is not recognize as a master shelf	No action needed, this LED can be off during the start-up sequence
RMT	OFF	Not used in 5548C SSU	
EXP	GREEN	The 5548C is an expansion shelf	No action needed
	GREEN Flashing	The expansion shelf is being started. When MST & RMT LEDs are Flashing together with the EXP, the network parameters have not been found in the POWER B card.	No action needed, the 5548C is starting as starting as an expansion shelf. If network parameters have not been found, insert the POWER B card or send it for repair after a last plug-in/out manipulation
	OFF	The 5548C is not recognize as an expansion shelf	No action needed, this LED can be off during the start-up sequence
USC	ORANGE	At least one user is logged and handled by the security management	No action needed
	OFF	No user is logged into the security management	No action needed
CR	RED	A critical alarm has been reported by the shelf	Check the current active alarms of the whole shelf
	OFF	No critical alarm is currently active or the alarm has been cut-off	No action needed
MJ	ORANGE	A major alarm has been reported by the shelf	Check the current active alarms of the whole shelf
	OFF	No major alarm is currently active or the	No action needed

LED	State	Description	Action
		alarm has been cut-off	
MN	YELLOW	A minor alarm has been reported by the shelf	Check the current active alarms of the whole shelf
	OFF	No minor alarm is currently active or the alarm has been cut-off	No action needed
ACO	RED	At least one alarm has been cut-off	If you do not know which alarm has been cut-off, control the current active alarms.
	OFF	No alarm is currently cut-off	No action needed

Table 8-11 MAnangement Card Troubleshooting - visible LEDs

8.2.1.10 Power Card (POWER)

LED	State	Description	Action
STATUS	GREEN	The card is working and the power is distributed correctly	No action needed
	RED	No power is detected The POWER card's fuse is failed	1. Measure the voltage on the power connectors and verify that it is inside the specified range 2. Measure the fuse located on the front panel of the MAC card and replace it if necessary 3. If the card doe not work after the fuse replacement, return it for repair

Table 8-12 Power Card Troubleshooting - visible LEDs

8.2.2 Alarm Behavior - Visible with Software

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
Active Input Changed	ACTINP	N/A	THC	The THC has selected another input as reference.	Check the previously selected input.
Alarm Cut-Off	ACO	N/A	MAC	The alarm cut-off has been activated, either physically with the pushbutton on the MAC or remotely with the TL1 command.	No action needed, if yopu are enar the shelf, check that all LEDs have lit.
Alarm Indication Signal	AIS	MN	INC-1	Alarm indication signal alarm.	Check the E1 signal in question.
Antenna failure	ANT	MJ	GPS-A, GPS-B	No connection to the GPS antenna. The cable can be openend or shorted	1. Check that the GPS antenna cable is correctly connected to the antenna, to the EMP arrestor and to the 5548C 2. Check that the EMP capsule is not blown 3. Measure the GPS antenna cable on the antenna side and check that there is about 5 Volts 4. Check the GPS antenna
Bad Position	PROGFLT	N/A	All	The card is inserted in the wrong slot.	Locate the card and move it to the correct slot. You can use the drawings situated at the end of this user manual
Bipolar	BPV	MN	INC-1	Bipolar Violation with AMI code:	Check the E1 signal in question.

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
Violation				• 1 or more BPV detected during an interval of 1s • If Threshold alarm is enabled: o When BPV rate of the total number (2.048E+06) during 1s, is higher or equal than the Threshold selected	
Code Violation	CV	MN	INC-1	<u>Bipolar Violation with HDB3 code:</u> • 1 or more CV detected during an interval of 1s • If Threshold alarm is enabled: o When CV rate of the total number (2.048E+06) during 1s, is higher or equal than the Threshold selected	Check the E1 signal in question.
CRC-4	CRC4	MN	INC-1	• 915 CRC-4 values or more are false on a total of 1000 (ITU-T G.706) • If Threshold alarm is enabled:	Check the E1 signal in question.

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
				o When false CRC-4 values rate of the total number (1000) during 1s, is higher or equal than the Threshold selected	
Dead	EQPT	MJ	All	The system is not able to communicate with the card	1. Initialize the card in question 2. Pull it out and reinsert it 3. If the above action did not clear this alarm, return the card for repair
EGC Link Broken	LNKBRK	MJ	EGC-A, EGC-B	No signal at all is received by the EGC card	Check the cable connected to LINK A and/or LINK B connector on Management Tile.
EGC Link Signal Failure	LNKSIG	MJ	EGC-A, EGC-B	One signal is not received by the SGC card	Check the cable connected to LINK A and/or LINK B connector on Management Tile.
External Alarm	EXT	CR, MJ, MN, N/A	EXT-1…EXT-10	External alarms coming from third party equipment connected to the input port alarm on the Management tile. EXT-1..3=CR; EXT-4..6=MJ; EXT-7..9=MN; EXT-10=N/A	Check the device connected to the alarm input which presents an alarm.
Fast Start	FSTSYNC	N/A	THC	The THC card is in fast-start mode in order to synchronize its system against the input signal selected rapidly.	No action needed, leave the THC ending their fast start procedure.
Free Run	FRNGSYNC	MJ	THC	The THC card has not been fed with input signal reference since it has been powered-up	If this behavior was not excepted, follow this procedure: 1. Check the INC cards

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
					configuration and operation 2. Check the Input Line configuration 3. Check the input lines connected to the shelf
General failure redundant ko	EQPT	CR	All	A general failure has been detected on a card and its redundant card is not OK	1. Verify the status of the card 2. Initialize the card in question 3. Pull it out and reinsert it 4. If the above action did not clear this alarm, return the card for repair
General failure redundant ok	EQPT	MJ	All	A general failure has been detected on a card but its redundant is OK	1. Check the status of the card 2. Initialize the card in question 3. Pull it out and reinsert it 4. If the above action did not clear this alarm, return the card for repair
GPS OCXO Failure	GPSOCXO	MJ			The GPS card's internal Oscillatore is deftective and the card should be returned to the factory for repair.
GPS Receiver	GPSRCVR	MJ	GPS-A, GPS-B	Not enough satellites are received	1. Check that the GPS antenna has a clear view of the sky and respects the conditions described in section 3.5. 2. Check that a in-line amplifier is mounted if the cable length is longer than 70 meters
Holdover	HLDOVRSYNC	MJ	THC	The THC card has lost its input signal reference and hence generate the signal itself to rest of	If this behavior was not excepted, follow this procedure: 1. Check the INC cards

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
				the shelf	configuration and operation 2. Check the Input Line configuration 3. Check the input lines connected to the shelf
Improper Removal	IMPRPRMVL	MN	All	When a card is removed from its slot while it is operating	1. If the slot in question is supposed to remain empty, disable the slot with the following command: `DLT-EQPT::`**`INC-1-A/INC-1-B/GPS-A/GPS-B/THC-A/THC-B/SGC-A/SGC-B/OUC-1-A..OUC-3-B/MAC-A`**`:CTAG;` 2. Otherwise, reinsert the corresponding card in the slot
Internal Error	INTERR	N/A	All	An internal error has been detected in the card system	1. Check the status of the card 2. Initialize the card in question 3. Pull it out and reinsert it If the above action did not clear this alarm, return the card for repair

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
Loss Of Signal	LOS	MN	INC-1	With E1 signal: • The signal is lower than -15dB with a terminated connection • The signal is lower than -35dB with a bridged connection With Frequency signal: • Signal level is lower than 200mV rms with sine wave • Signal level is lower than 0.6V	Check the signal level in question.
MTIE Alarm	PRFMTIE	MJ	INC-1, GPS	The MTIE threshold has been crossed over by the current Performance Measurement	Check and measure the stability of the signal in question.
No Reference	NOREF	MJ	SGC, OUC	The card is not fed with signal	1. Check the status of the OUC and SGC cards 2. Check the configuration and operation of the THC card

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
Out Of Frame	OOF	MN	INC-1	• SSM is enabled and frame type is PCM31 • 3 consecutive incorrects FAS words (ITU-T G.706) • If Threshold alarm is enabled: o When false words rate of the total number (4000) during 1s, is higher or equal than the Threshold selected	Check the E1 signal in question
Out Of Limits	OOL	MN	INC-1	With Frequency signal: • The frequency is not recongnised by the system • Delta f / f > 50ppm	Check the signal in question
Output Failure	EQPT	MJ	OUC, SGC	A failure has been detected on an output line (OL)	1. Verify the output signal 2. Check the OUC configuration and operation 3. Check the SGC configuration and operation Check the THC configuration and operation
Output Shorted	SHORTED	MN	OUC	A output Line (OL) has been detected as shorted	Check the output cable and its connectors
Output	SQLCH	N/A	OUC	The output line (OL) is squelched	No action needed. To unsquelch

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
Squelched					the port, simply deactivate it with the command “ED-EQPT-OL”.
Performance Failure	PRF	MN	INC-1, GPS	A failure of Performance Measurement has been detected	Control and measure the wander of the signal in question.
Power Failure	PWR	MN	PWR-A, PWR-B	A power failure has been detected	1. Measure the power on the power connectors 2. Check the fuse embedded in the POWER card in question 3. Return the card for repair if the above action could not determine the cause of failure.
Redundancy Failure	EQPT	CR	INC, GPS, THC, SGC, OUC	The card group is in failure	1. Check the status of the cards 2. Initialize the cards in question 3. Pull it out and reinsert it 4. If the above action did not clear this alarm, return the card for repair
Reference Passthrough	REFPT	N/A	SGC	The SGC card has detected that the INC card provides the signal directly to itself, without passing through the THC cards. The shelf is so in pass-through mode.	No action needed. If this behavior was not expected, control and check the configuration and status of the THC cards
Reference THC-A	REFA	N/A	SGC	The SGC card has detected that the signal fed to itself is provided by the THC-A card	No action needed except if a failure has been detected in THC-B. If you prefer to get the

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
					THC-B active, simply send the command "SW-DX".
Reference THC-B	REFB	N/A	SGC	The SGC card has detected that the signal fed to itself is provided by the THC-B card	No action needed except if a failure has been detected in THC-A. If you prefer to get the THC-A active, simply send the command "SW-DX".
Software download	SWFTDWN	N/A	All	The card is currently downloaded	No action needed. Wait until the end of the download.
SSM Failure	SSM	MN	INC-1	When unknown SSM value is decoded for more than 10 seconds, once valid SSM value has already been read	Check the SSM information carried in the DS1 input reference in question.
SSM IQL Changed	SSMIQL	N/A	INC-1, GPS	The input SSM quality has changed	No action needed. Check the SSM sent to the input in question.
SSM OQL Changed	SSMOQL	N/A	THC	The output quality has changed	Retrieve which event has made the SSU shelf to change its output quality. It can be a reference input switching, the input quality has changed or the SSU is in holdover.
System Mode Error	EQPT	N/A	MAC	The rotary switch located on the management tile is not correctly configured	Turn the rotary switch with a flat screwdriver to the correct position: 0: MASTER

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
					1: Not Used 2: EXPANSION 1 3: EXPANSION 2 4: EXPANSION 3 5: EXPANSION 4
System Reboot Cold	SYSBOOT	N/A	All	The system is rebooting applying factory default parameters	No action needed. Wait until reboot completion.
System Reboot Warm	SYSBOOT	N/A	All	The system is rebooting keeping user-configured parameters	No action needed. Wait until reboot completion.
TDEV Alarm	PRFTDEV	MJ	INC-1, GPS	The TDEV threshold has been crossed over by the current Performance Measurement	Check and measure the stability of the signal in question.
Test Date Error	PROGFLT	MJ	All	The date when the card has been factory tested is not correct	Unplug and plug-in the card and if it doesn't resolve the problem, return the card for factory repair.
Version Error	PROGFLT	MJ	All	The firmware version installed in the card does not correspond or is outdated compared the rest of the shelf version	Download the correct firmware in the card with the command "`ACT-DNLD`" after verified that the firmware is in the MAC card.
Wait To Restore	WTR	N/A	INC-1, GPS	The input line has been recovered and qualified by the system but will be available for selection only once the WTR time elapsed.	No action needed, however, it is possible to initialize the WTR time with the TL1 command: `INIT-WTR::`**`1-1/1-2/1-3/1-4`**` :CTAG;`
Warmup	WARMUPSYNC	MJ	THC	The THC internal oscillator is warming up. The time depends on the type of oscillator (Quartz or Rubidium)	No action needed. The THC oscillator must warm-up before going in fast-start mode.
Wrong MADDS version	PROGFLT	CR	THC	The MADDS (Manual & Automatic Direct Digital Synthesis) system embedded in the THC got a wrong version compared to the release	Download the correct firmware in the MADDS with the command "`ACT-DNLD`" after verified that the firmware is in the MAC card.

Condition Description	Cond. Type	Sev.	Cards in cause	Description	Action
				version of the shelf.	
YM Alarm	PRFYM	MJ	INC-1, GPS	The YM threshold has been crossed over by the current Performance Measurement	Check and measure the stability of the signal in question.

Table 8-13 Troubleshooting - visible with Software

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8.3 Cards & Tiles Replacement or Addition

8.3.1 Overview

The modular flexibility of the OSA 5548C SSU prevents major service availability malfunction the system, increasing the OSA 5548C SSU reliability. All cards and rear tiles can be replaced without affecting the other groups of cards or tiles.

Each slot has a specific number (A1 to A17), a DIN connector and a locating tooth to avoid incorrect slot insertion.

The OSA 5548C is able to detect hot module insertion or extraction. All cards are “hot plug and play”, which means that you can add, remove or replace a card at any time, under power, without disturbing the system.

8.3.2 Card Insertion

8.3.2.1 Before Replacing any Card

If a card is alone in its group (unprotected), e.g. if there is the THC-A but not the THC-B, if you replace the card with a new one, it is necessary to reconfigure the replaced card once installed.

However, if the group is fulfilled with its two possible cards (protection 1:1), the remaining card will transfer its configuration to the newest installed.

The factory recommends that the following commands be executed, and the response stored before removing an unprotected card (to be used to restore configuration on replacement).

INC cards:
To store the parameters
    RTRV-EQPT-IL

To restore the parameters
    ED-EQPT-IL

For THC cards:
To store the parameters
    RTRV-EQPT-THC

    RTRV-PRIO

    RTRV-EQPT-MADDS

To restore the parameters

ED-EQPT-THC

ED-PRIO

ED-MADDS

For SGC cards:

To store the parameters

RTRV-EQPT-SGC

To restore the parameters

ED-EQPT-SGC

For OUC cards:

To store the parameters

RTRV-EQPT-OL

RTRV-EQPT-OG

RTRV-EQPT-OUC

To restore the parameters

ED-EQPT-OL

ED-EQPT-OG

ED-EQPT-OUC

For MAC cards:

To store the parameters

RTRV-EQPT-MAC

To restore the parameters

ED-EQPT-MAC

***Note*:**

The *SyncView PLUS* management software has a back-up tool which can save the configuration and restore it in any shelf.

8.3.2.2 Card Addition or Replacement Procedure

The procedure is identical for each type of card

CAUTION

- When handling the OSA 5548C SSU unit or spare cards, use a grounded wrist strap to avoid ESD (Electro Static Discharge)
- Avoid touching components or connectors
- Avoid placing the card on an ungrounded surface
- Avoid placing the card on or near insulated elements and/or surfaces

STEP	ACTION
1	Locate and verify the slot you want to insert the card.
2	If a card or tile already occupies the slot, unscrew it using a flathead screwdriver and pull it out carefully, still using ESD precaution.
3	Align the card edge with the top and bottom metallic slides until you can slide the module inside. **CAUTION** **Prior to insert any card, verify that currently inserted cards have their locking screws well tightened!**
4	Slide the card in carefully, until it sits well on the rear DIN connector.
5	Verify that the card has been correctly inserted.
6	Tighten the two screws of the card located on the top and the bottom of its front panel.

Procedure 8-3 Card Addition or Replacement

8.3.3 Connector Tile Insertion

The output tiles automatically configure the output when inserted.

STEP	ACTION
1	Locate and verify the position in which to insert the tile.
2	If a tile is already fixed, unscrew it using a flathead screwdriver.
3	Insert the tile slowly into the green printed connector card.
4	Verify that the connection has been correctly installed.
5	Tighten the four screws of the connector tile.

Procedure 8-4 Connector Tile Insertion

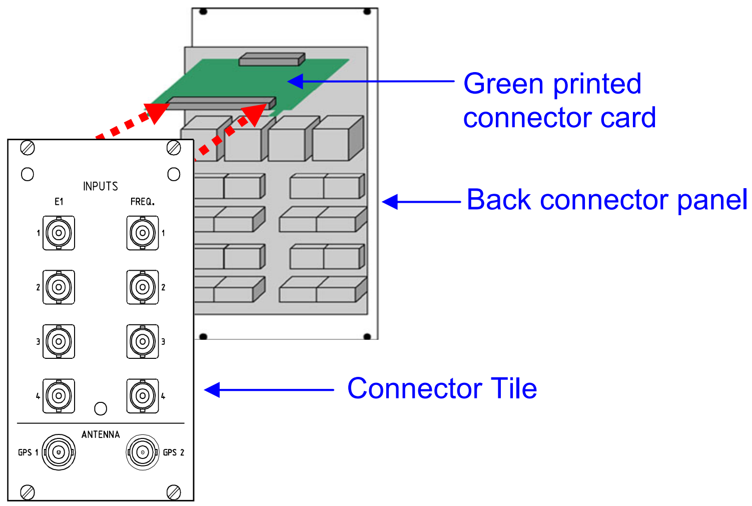

Figure 8-1 : Input Connector Tile Insertion

8.4 Fuse Replacement

8.4.1 Introduction

The power is distributed from the power connector tiles through the POWER A & B cards which provide a first power security with the fuse positioned on the front panel. Then the power is distributed to each single card in the shelf, and then is distributed to each single card in the shelf, which converts the shelf power to card power. Each card has an independent on-board fuse.

8.4.2 Conditions for Replacing the Fuse

8.4.2.1 POWER Card Fuse

If the either POWER Cards LED is not lit Green despite correct power applied to the shelf, check the front panel shelf fuse.

8.4.2.2 Single Card Fuse

If a card cannot light its LEDs anymore, the fuse might be the cause of such behavior.

***Note*:**

- Fuse specifications and Order Numbers are described in 0
- If the replaced fuse blows again, replace the card

8.4.3 Fuse Location

8.4.3.1 POWER Card Fuse

The fuse is located on the front panel of the POWER A & POWER B cards

8.4.3.2 Single Card Fuse

All the cards, except POWER A & POWER B, have their fuse at the same place, as shown here below:

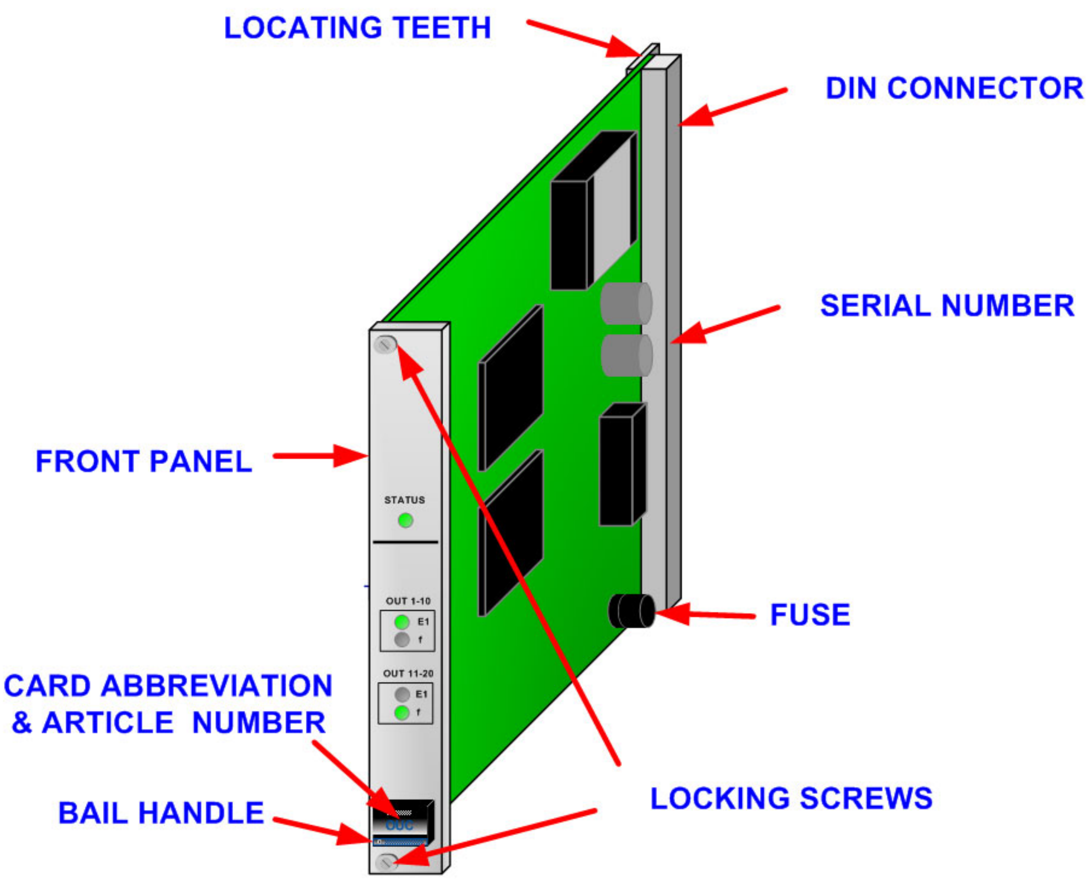

Figure 8-2 : Single Card Fuse Location

8.4.4 Fuse Replacement Procedure

8.4.4.1 POWER Cards Fuse

STEP	ACTION
1	Unscrew the fuse with a flat screwdriver doing a ¼ CCW turn rotation.
2	Pull out the fuse from its holder socket
3	Remove the fuse from the black fuse holder
4	Measure the fuse resistance with an ohmmeter and check that the value is infinite. If the resistance is at 0 ohms, the fuse is not the cause of the trouble; you should check the power fed.
5	If necessary replace the fuse with a new one
6	Insert it in the black fuse holder
7	Insert the fuse in its holder socket on the POWER card
8	Screw it doing ¼ CW turn rotation
9	Check that the POWER card LED lights in Green. If it is not the case, measure the power feed.

Procedure 8-5 Power Card Fuse Replacement

8.4.4.2 Single Card Fuse

CAUTION

- When handling the OSA 5548C SSU unit or spare cards, use a grounded wrist strap to avoid ESD (Electro Static Discharge)
- Avoid touching components or connectors
- Avoid placing the card on an ungrounded surface
- Avoid placing the card on or near insulated elements and/or surfaces

STEP	ACTION
1	Unscrew the two locking screws of the intended card
2	Remove the card carefully with its bail using ESD protection
3	Put the card on an ESD protected surface
4	Pull out the cylindrical fuse located on the erar bottom of the card
5	Measure the fuse resistance with an ohmmeter and check that the value is infinite. If the resistance is at 0 (zero) ohms, the fuse is not the cause of the trouble; the card might be failed and should be returned to your Oscilloquartz representative for repair.
6	If necessary replace the fuse with a new one
7	Insert the fuse in its socket holder.
9	Plug the card in its slot **CAUTION** **Prior to insert the card, verify that currently inserted cards have their locking screws well tightened!**
10	Check that the card lights its STATUS LED GREEN and make a LAMP TEST to confirm
11	Tighten the card locking screws

Procedure 8-6 Single Card Fuse Replacement

8.5 Repair & Return

When you need to return a defective part for factory repair, follow this procedure.

STEP	ACTION
1	Gather the following information: • a full description of the trouble (alarms, behavior, etc.) • part or article number • serial number • firmware version
2	Contact the Oscilloquartz technical support, if you are not sure about the trouble.
3	Fill a RMA-request form and send it to your Oscilloquartz representative.
4	We in turn will issue a RMA number (ex: I001234) and inform you of a standard repair cost (if applicable) and an estimated repair time. If not, we will quote you the repair price after evaluation of the part.
5	Once you receive the RMA number you can then proceed in returning the faulty material to our premises stating the RMA number on your export documents. 1. Place your packing slip / delivery note inside the original parcel or contact Support if cartons are required, and state: "**Repair & Return**" and the "**RMA**" given above. 2. The material must be returned in the original packaging or approved replacement packaging with ESD (Electro-Static Discharge) protection for the warranty to be respected. 3. Shipment has to be made from your location to our factory on a "CIP" basis (Incoterms 2000). 4. Please include copies of the shipping documents (delivery note and proforma invoice) **inside** and **outside** the parcel. 5. After shipping, please fax us full shipping details for follow up from our end. 6. For warranty repairs, state OSA Delivery note or invoice number on your packing slip / delivery note / proforma invoice. .

Procedure 8-7 Repair & Return

STEP	ACTION
	During the warranty period, the costs of shipping the faulty material to OSA or to return it to the customer will be born by OSA (with exception of transportation like DHL, FEDEX, or other, local taxes, customs clearance, etc...). Outside the warranty period, these costs will be borne by the Customer. 7. Ship the material insured to one of the addresses below: **Oscilloquartz SA** Attn. "Repair & Return" 16, Rue de Brévards 2002 Neuchâtel 2 SWITZERLAND
6	If the material is out of the warranty period, we then request you to sign and date the document containing the RMA number as acknowledgement of our proposed intervention. The document can be used as a Purchase Order if your company policy allows it.

8.6 Oscilloquartz Contact Information

8.6.1 Technical Assistance

For technical assistance, contact the following:

8.6.1.1 International

Oscilloquartz SA
Customer Support & Services
16, Rue de Brévards
2002 Neuchâtel 2
SWITZERLAND

Tel: +41-32-722-5555
Fax: +41-32-722-5578
e-mail: css@oscilloquartz.com

8.6.2 Sales

For sales assistance, contact the following:

8.6.2.1 International

Oscilloquartz SA
Sales & Marketing
16, Rue de Brévards
2002 Neuchâtel 2
SWITZERLAND

Tel: +41-32-722-5555
Fax: +41-32-722-5556
e-mail: osa@oscilloquartz.com

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Chapter

9. Specifications

Including:

- ❖ Communication
- ❖ Input Specification
- ❖ Tracking & Holdover
- ❖ Performance Measurement (PM)
- ❖ Outputs
- ❖ Alarms
- ❖ Power Supply
- ❖ Mechanical
- ❖ General

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9.1 Communication

Local communication	
Serial connectors	• 2x RS-232C on 9 way D-type connector, male
Labels & location	• "LOCAL COMM." on the front panel of the POWER-B card • "LOCAL COMM." on the Management tile or on the Remote Panel
Baud rate	• 19200 kbs
Parity bit	• None
Stop bits	• 1
Flow control	• None
Language	• TL1
Remote communication	
Remote connector	• 1x Ethernet (TCP/IP), RJ-45 connector, 10 and 100 Base-T
Label & location	• "LAN COMM." on the Management tile
Language	• TL1
Protocol	• Raw data or Telnet
Communication ports	• Up to 25
Simultaneous sessions	• Up to 5 per each port and 32 max.on all ports

Table 9-1 Communication Specifications

9.2 Input Specification

E1 inputs	
Connector	• BNC 50 Ω female
Label	• E1 1 to 4
Ports	• Up to 4, providing 4x E1 inputs 1:1 protected when all INput Cards (INC) are installed
Configuration	• Up to 2 INput Cards (INC), providing 1:1 protection
E1	• ITU-T G.703-9
Supported Code	• HDB3 and AMI (user selectable)
Supported Frame	• PCM30, PCM30C, PCM31 (SSM disabled), PCM31C
Synchronization Status Messaging (SSM)	• Fully supported
Level	• nominal to -15dB in Terminated mode • nominal to -35dB in Bridged mode
Impedance	• 75 Ω (terminating mode) • 1000 Ω (bridging mode)
Input failure criteria	• Loss Of Signal (LOS) -15dB in Terminated mode or -35dB in Bridged mode • Alarm Indication Signal (AIS) • Out Of Frame (OOF) according to G.706 and according to user-defined threshold (10E-4, 10E-3, 10E-2) • CRC-4 according to G.706 and according to user-defined threshold (10E-4, 10E-3, 10E-2) • BiPolar Violation (BPV) if code is AMI or Code Violation (CV) if code is HDB3 according to G.706 and according to user-defined threshold (10E-4, 10E-3, 10E-2) • SSM failed (when the SSM code is unknown after 10s) • MTIE/TDEV and YM Performance Threshold
Frequency inputs	
Connector	• BNC 50 Ω female
Label	• FREQ. 1 to 4
Ports	• Up to 4, providing 4x FREQ. inputs 1:1 protected
Configuration	• Up to 2 INput Cards (INC), providing a groups in 1:1 protection when all INput Cards (INC) are installed
Frequency	• 2.048, 5 or 10 MHz, ± 50 ppm (automatic detection)
Wave	• Sinusoidal or Square
Level	• min 0.4 Vrms (Sinus) • max 2 Vrms (Sinus) • max 5 Vpp (Square)
Return Loss	• ≥ 15dB
Impedance	• 50 Ω ± 10%
Input failure criteria	• Loss Of Signal (LOS) • Out Of Limit (OOL) when f/f > 50ppm

GPS	
Connector	• BNC 50 Ω female
Label Ports Configuration GPS Channels Antenna	• GPS 1 & GPS 2 • Maximum 2, providing 1x GPS inputs 1:1 protected when both GPS cards are installed • Up to 2 GPS Cards, providing 1:1 protection • 12 satellites simultaneously tracked • Active L1 antenna, 1575.42 MHz

Table 9-2 Input Specifications

9.3 Tracking & Holdover

Tracking & Holdover	
Type	• Tracking and Holdover Card (THC) incorporating Direct Digital Synthesis (DDS)
Configuration	• Up to 2 THC cards for 1:1 protection
Best performance	• Exceeds G.811 reference with embedded GPS (or external Cesium) source
Holdover	• THC with Rubidium (Rb) - SSU Type II *Stability: 5E-11/month* • THC with Double Oven Controlled Quartz (OCXO) - SSU types I, III, IV or V *Stability: 1E-10/day*
Freerun	Frequency accuracy for: • SSU type II (Rb): +/- 1.6E-8 • SSU types I and V : Not Applicable
Input selection	• Priority table • SSM value • Performance mask • Manual selection
Pull-In / Hold-In	The system accepts references according to: • SSU type I (OCXO) : +/- 1E-8 • SSU type II (Rb): +/- 1.6E-8 • SSU types III (OCXO) : +/- 4.6E-6
Jitter tolerance	• Exceeds ITU-T G.812 9.2 (EN 300 462-4-1 7.1)
Wander tolerance	• Exceeds ITU-T G.812 9.1 (EN 300 462-4-1 7.2)
Wander Generation	• MTIE and TDEV limit: • Exceeds ITU-T G.812 8.1 (EN 300 462-4-1 6.1)
Wander transient	• Exceeds ITU-T G.812 10 (EN 300 462-4-1 6.8)
Jitter generation	• Exceeds ITU-T G.812 8.3.1 (EN 300 462-4-1 6.8) – max. 0.05 UI
Transient response	• Exceeds ITU-T G.812 11.1.1 and EN 300 462-4-1
Phase discontinuity	• Exceeds ITU-T G.812 11.4 (EN 300 462-4-1)
Filtering Bandwidth	• SSU type II and III : 1mHz • SSU type I : 3mHz

Table 9-3 Tracking Holdover Specifications

9.4 Performance Measurement (PM)

PM	
Resolution	• 1 ns
Sampling rate	• 1 s (1Hz)
Interval of measurement and calculation	• 3 hours to complete a PM set
Type	• MTIE (Maximum Time Interval Error) • TDEV (Time DEViation) • Ym (Factional Deviation)
PM default threshold	• MTIE and TDEV: ITU-T G.812 9.1 related to SSU type I • YM: 5ppm
MTIE	• Algorithm according to ITU-T G.810 Appendix II.5
TDEV	• Algorithm according to ITU-T G.810 Appendix II.3
Ym	• Algorithm according to Telcordia GR-1244 3-43
PM storage capacity	• 24 hours of PM, 8 PM sets + the on-going set

Table 9-4 Performance Measurement (PM) Specifications

9.5 Outputs

E1	
Connector	• CEI 1.0/2.3, SUB-D 25 pins or BNC (50 Ω) Remote panel
Label	• OUT 1..10 and 11..20 E1
Ports	• Up to 60, providing 60x E1 outputs 1:1 protected when all OUtput Cards (OUC) are installed.
Configuration	• Up to 6 OUtput Cards (OUC), providing 3 groups in 1:1 protection
E1	• ITU-T G.703-9
Level	• Nominal
Impedance	• 75 Ω (ASYMM.) or 120 Ω (SYM.)
Time Slot 16 structure	• CCS or CAS (user selectable)
Supported Code	• AMI and HDB3 (user selectable)
Output failure criteria	• Failed, when the amplifier is detected as defective • Shorted, when the output line impedance is too low
2.048MHz	
Connector	• CEI 1.0/2.3, SUB-D 25 pins or BNC on Remote panel
Label	• OUT 1..10 and 11..20 f
Ports	• Up to 60, providing 60x outputs 1:1 protected when all Output Cards (OUC) are installed.
Configuration	• Up to 6 OUtput Cards (OUC), providing 3 groups in 1:1 protection
2.048MHz	• ITU-T G.703-13
Level	• Nominal
Impedance	• 50Ω (ASYM.)
Output failure criteria	• Failed, when the amplifier is detected as defective • Shorted, when the output line impedance is too low

PPS outputs	
Connector	• BNC 50 Ω female
Label & location	• PPS 1 & PPS 2, located on the Management tile
PPS	• Width : 20 µs • Rise time : <30ns
Level	• 5V
Impedance	• 50 Ω
Synchronization	• To UTC (Universal Time Coordinate) when at least one GPS cards is locked on GPS satellites

Table 9-5 Output Specifications

9.5.1 NTP

TCC-NTP	
Connector	1x Ethernet (TCP/IP), RJ-45 connector, 10 or 100 Base-T on NTP connector tiles
Label	NTP PORT
Ports	Up to 3
Configuration	Up to 3 TCC-NTP cards
NTP	RFC 1305 / Version 3
SNTP	RFC 4330 / Version 4
Precision	+/- 25us when locked to GPS
Management	• HTTP • TL1 via common 5548C management system
Encryption	64 bits RSA™ MD5 encryption
TCP/IP Configuration	DHCP / Fixed IP

Table 9-6 NTP Specifications

9.5.2 PTP

TCC-PTP	
Connector	SFP cage that can hosts both electrical and optical transceiver.
Label	PTP PORT
Ports	1 on front panel
Configuration	Up to 6 (E60) or 20 (E200) TCC-PTP cards
Protocol	IEEE 1588-2008 v2
Capability	Unicast, up to 128pkt/s
Precision	+/- 50ns when locked to GPS
Management	• SVP • TL1 via common 5548C management system
TCP/IP Configuration	DHCP / Fixed IP

Table 9-7 PTP Specifications

9.6 Alarms

9.6.1 General

Alarms	
Representation	• On the front side of the shelf, on every single card's front panel • Visible and audible, receivable form a third part device in local with 10 input relays • Alarm levels (MN, MJ, CR) transmittable remotely with 2x 3 relays NO (Normally Opened) and NC (Normally Closed)
Alarm levels	• CRITICAL • MAJOR • MINOR • Non Alarm condition
Alarm & Events log capacity	• 254 items in a FIFO sequence

Table 9-8 General Alarms Specifications

9.6.2 Input Alarms

Input Alarm Relays	
Connector	• SUB-D 25p. male with 10x pairs of pins IN and GND
Label & Location	• "EXT. ALARM INPUTS", located on the rear side on the Management connector tile.
Alarms Severity	• Port #1 to #3 : CR – Critical • Port #4 to #6 : MJ – Major • Port #7 to #9 : MN – Minor • Port #10 : Non-alarm condition

Table 9-9 Input Alarms Specifications

9.6.3 Output Alarms Relays

Output Alarm Relays	
Connector	• 2 SUB-D 9p female connectors providing 2 groups splitted in 3 rows of pins for CR (Critical), MJ (Major) and MN (Minor) alarm level status. Each row is splitted in 3 pins, such as NO (Normally Opened), C (Common), NC (Normally Closed).
Label & Location	• “ALARM OUT GROUP 1” and “ALARM OUT GROUP 2”, located on the Management connector tile.
DC	
Voltage	• Maximum 60 VDC
Current	• Maximum 1 A
AC	
Voltage	• Maximum 125 VDC
Power	• Maximum 60 VA
Current	• Maximum 1 A

Table 9-10 Output Alarms Relays Specifications

9.7 Power Supply

Power Supplies	
Connectors	• Redundant connectors “POWER A” and “POWER B”. Each contains one “+” and one “-“ connectors and two Grounding (GND) studs
Label & location	• POWER A located on the rear right of the shelf and POWER B on the rear left of the shelf
Input Voltage	• -40 to -60 VDC (-48 VDC nominal)
Power Consumption	Fully loaded with THC Rubidium • Warm-up: max. 117W • Steady-state: max. 90W Fully loaded with THC Quartz • Warm-up: max. 92W • Steady-state: max. 72W
Fuse types	2x T 6.3A L 250V 5x20mm size located on the front panel of the POWER A and POWER B Cards

Table 9-11 Power Supply Specifications

9.8 Mechanical

Mechanical	
Mounting	• ETSI or 19'' rack mounting
Size **H x W x D**	• Vertical rack size: 26.6 cm (10.5 inches) 6U • Depth rack size: 24.60 cm (9.7 inches) • Width rack size: 53.3 cm (21 inches) ETSI or 48.26 cm (19.0 inches) 19"
Weight	• SSU: 10 kg (22 lbs) fully loaded with THC Rubidium type cards embedded • Remote Panel: 1.75 Kg (3.85 lbs) + 10x flat cables • Management Panel: 1.6 Kg (3.52 lbs)

Table 9-12 Mechanical Specifications

9.9 General

General	
Architecture	Main OSA 5548C SSU-E60 fully loaded : • 2x INC cards • 2x GPS cards • 2x THC cards • 2x SGC cards • 6x OUC cards • 1x MAC card • 2x POWER cards
Long term frequency accuracy	• ITU-T G.811 : G.811 PRC
Input reference	• E1 • 2.048, 5, 10 MHz • GPS
Output signals	• E1 • 2.048 MHz • PPS
Synchronization Status Messages (SSM)	• ITU-T G.703
Expansion shelves	• Up to 4 expansion shelves* providing 200 more 1:1 outputs each one, for a total of 860 1:1 protected outputs

*: Contact Oscilloquartz for availability

Environmental	
Environment	• Storage: as specified in ETS 300 019-1-1, class 1.1 • Transportation: as specified in ETS 300 019-1-2, class 2.2 • Operation: as specified in ETS 300 019-1-3, class 3.2
Operating Temperature Range	• -5° to +45°C
Storage Temperature	• -20° to +50°C
Humidity	• 5 to 95% no condensing.
Norms and certificates	
EMC & ESD	• Emission : EN 55022 ClassB • Immunity : EN 55024
Safety	• Conformance to EN60950-1
Compliance	Built to comply with: • CE • ITU-T G.703, G.811, G.812, G.704, G.781 • ETSI EN 300 462-6, -4

Table 9-13 General Specifications

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Ordering Information

The following tables contain the articles and drawing numbers for each component.

Card Spares & Replacements

Description	Article number	Drawing number
Power A card	**A014122**	942.085.710
Power B card	**A014123**	942.085.711
Power fuse (batch of 10)	**A014164**	967.316.631
Input Card - INC (4 inputs per card)	**A014455**	942.085.081
GPS – GPS card	**A014154**	942.085.090
Tracking and Holdover Card - THC Rubidium	**A014460**	942.082.300.20
Tracking and Holdover Card - THC OCXO	**A014462**	942.082.301.20
Signal Generator Card - SGC (no expansion shelf possible)	**A014458**	942.085.991.20
Signal Generator Card - SGC only for 5548C r1.41 and higher	**A015232**	942.085.993
Output Card - OUC (20 Freq/E1 outputs per card)	**A014435**	942.085.172
MAnagement Card - MAC	**A014118**	942.085.529
TCC-NTP card	**A015490**	942.085.047
TCC-NTP card with front access / no tile set needed	**A015911**	942.085.048
TCC-PTP card	**A016433**	942.085.049
Blank Panels for unused INC, GPS, SGC, OUC, NTP,PTP, MAC – batch of 20	**A014153**	982.080.304.51
Blank Panels for unused THC – batch of 10	**A014155**	982.080.312.51

Tile Spares & Replacements

Description	Article number	Drawing number
Power Tile panel A	**A014124**	942.089.530.10
Power Tile panel B	**A014125**	942.089.530.11
Input Tile panel	**A014448**	942.089.300
Management Tile panel	**A014594**	942.089.280.20
20x MHz/E1 output Tile with 20x CEI 1.0/2.3 asymmetrical	**A014438**	942.089.290
20x MHz/E1 output Tile with dual 20 pins flat cable connectors (IDC) for Remote BNC panel	**A014635**	942.089.294.10
NTP Output Tile	**A015509**	942.089.266
Blank Output tile	**A014166**	982.080.312.51

Remote Panel

Description	Article number	Drawing number
Remote BNC panel for 60 outputs; ETSI mounting	**A014724**	982.060.610
Remote BNC panel for 60 outputs; 19" mounting	**A014856**	982.060.620
90 cm - Flat cable for Remote BNC panel (10 outputs per cable)	**A014548**	957.752.002.91
300 cm - Flat cable for Remote BNC panel (10 outputs per cable)	**A014549**	957.752.002.305
100 cm - RJ-45 cable for Remote panel NTP connection	**A015513**	957.520.801.10
20x MHz/E1 output Tile with 20x BNC 75 ohms	**A014726**	942.060.870
Blank panel for Remote Output Tile	**A014730**	982.060.616
20x MHz/E1 output Tile with 20x BNC 75 ohms	**A014726**	942.060.870
20x MHz/E1 output Tile with 20x CEI 1.0/2.3 asymetrical	**A014920**	942.060.871
20x MHz/E1 output Tile with 10x SUB-D 9 symetrical (2 outputs per SUB-D)	**A014921**	942.060.872
Blank panel for Remote Output Tile	**A014730**	982.060.616

Fuse Parts & Replacement

The values and specifications for each card's fuse can be found in the following table.

Card type	Card article nbr.	Fuse specification	Fuse article nbr.
POWER A & POWER B fuse – batch of 10 pcs	PWR A: A014122 PWR B: A014123	T 6.3A / 250V	**A014164**

Accessories

Description	Article number	Drawing number
Printed user's manual	**A014632**	990.500.033
Element Manager on CD-ROM	**A014633**	S10.EM0.A81
Cable RS-232 AT-LINK 3meters	**A012740**	957.520.901

TCC-PTP Accessories

Description		Article number	Drawing number
Duplex optical LC connector	Gigabit Ethernet Optical SFP Transceiver	**A016712**	951.208.201
Copper SFP transceiver	Gigabit Ethernet copper SFP Transceiver	**A016713**	951.208.202

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Glossary

μ:	Micro, used to express 0.000001
1 PPS:	1 Pulse Per Second signal
100 Base-T:	Ethernet Local Area Network.100 BaseT Ethernet has a transmission speed of 100 Mbps
ACO:	Alarm Cut-Off
AID:	Access IDentifier. The AID in a TL1 message uniquely identifies the entity to be acted upon by the input message to the OSA 5548C SSU.
AIS:	Alarm Indication Signal - a code sent to downstream sites to indicate an upstream failure (used to prevent unnecessary downstream alarms).
AMI:	Alternate Mark Inversion – code type belonging to DS1 signal
ANSI:	American National Standards Institute. American standards body that defines the characteristics and guidelines for telecommunications networks
ATAG:	Autonomous Correlation TAG
AWG:	American Wire Gauge
B8ZS:	Bipolar with 8 Zero Substitution - Code type belonging to DS1 signal
Bit (b):	BInary digiT
Bit/s:	Bit per Second
BITS:	Building Integrated Timing Supply, also called SSU, TSG or SASE
BPV:	Bipolar Violation - Two consecutives bits of the same polarity
Bytes (B):	Sequence of 8 bits
BDFB:	Battery Distribution Fuse Bay
CAN:	Controller Area Network – Communication bus technology used for internal communication in the OSA 5548C SSU
CC:	Composite Clock – 64/8 kHz signal
CE:	European Union regulatory community symbol
Cm:	CentiMeters (1 inch = 2.54 cm)
COMM:	Communication
CR:	Critical Alarm, the higher severity level of alarm
CV:	Code Violation
CTAG:	Correlation TAG
D4:	Also called SF (Super Frame) - A frame type belonging to the DS1 signal
dB:	Abbreviation for decibel
dBm:	dB referenced to one milliwatt
DDS:	Direct Digital Synthesis
DS1:	Digital Service level 1 -1.544 Mbit/s signal, also called T1
DUS:	Don’t Use for Synchronization
EMC:	Electro Magnetic Compatibility
EMI:	Electro Magnetic Interference
EMP:	Electro Magnetic Pulse - The electromagnetic radiation from a nuclear explosion. The resulting electric and magnetic fields may couple with electrical/electronic systems to produce damaging current and voltage surges.
EQPT:	EQuiPmenT
ESD:	ElectroStatic Discharge
ESF:	Extended Super Frame - A frame type belonging to the DS1 signal

ETSI:	European Telecommunications Standards Institutes
EXP:	EXPansion shelf
EXT:	EXTernal
FAT:	Equipement test protocol to ensure that contractual requirements are met
FCC:	Federal Communications Commission
FDL:	Facilities Data Link
FIFO:	First-In First-Out
FTP:	File Transfer Protocol
G:	Giga, used to express 1 000 000 000
GND:	GrouND termination point on equipment
GPS:	Global Positioning System
GR:	Generic Requirements
GUI:	Graphical User Interface
HDB3:	High Density Bipolar Order 3 Encoding
Hz:	Hertz – 1 Hertz equal 1 cycle per second
IEEE:	Institute of Electrical and Electronic Engineers
IN:	INput
INC:	INput Card
IP:	Internet Protocol or In Progress in TL1 autonomous answer
ISO:	International Standards Organization
ITU:	International Telecommunications Union
ITU-T:	International Telecommunications Union, Telecommunications service sector
Jitter:	Short-term non-cumulative variations of the significant instants of a digital signal form their ideal positions in time, expressed in seconds or in UI (unit interval)
k:	Kilo, used to express 1000
kg:	Kilo Gramms (1 lbs = 0.45 kg)
LAN:	Local Area Network
LED:	Light Emitting Diode
LOF:	Loss Of Frame
LOS:	Loss Of Signal
M:	Mega, used to express 1 000 000
m:	Milli, used to express 0.001 or meter
MAC:	MAnagement Card
MADDS:	Manual & Automatic Direct Digital Synthesis
MIB:	Management Information Base
MJ:	Major Alarm, the medium severity level of alarm
Mm:	MilliMeters
MML:	Man-Machine Language
MN:	Minor Alarm, the lower secverity level of alarm
MST:	Master shelf
MTIE:	Maximum Time Interval Error
NA or N/A:	Non Available or Non Applicable
NE:	Network Element
NEBS:	Network Equipment Building Systems
NC:	Not Connected
NG:	Next Generation

NVRAM:	Non-Volatile Random Access Memory
OCXO:	Oven Controlled Crystal Oscillator
OOL:	Out Of Limit alarm
OSA:	Oscilloquartz SA
OUC:	OUtput Card
OUT:	OUTput
PLL:	Phase Locked Loop
PM:	Performances Measurement
PPM:	Parts Per Million
PPS:	Pulse Per Second
PRC:	Primary Reference Clock
PRS:	Primary Reference Source
PWR:	PoWeR
QL:	Quality Level
QOS:	Quality Of Service
RAM:	Random Access Memory
RAN:	Return Authorization Number, also called RMA – Number required to return material for factory repair
Rb:	Rubidium
RES:	REServed
RFC:	Request For Comment
RJ-45:	Registered Jack 45 - 8 pin-connector for data transmission
RMT:	ReMoTe shelf
RS-232:	Interface for communicating serially between computer and terminals
RS-422:	Specification for electrical parameters of an interface only. RS422 is compatible with V11 and X21.
SASE:	Stand-alone Synchronisation Equipment
SDH:	Synchronization Digital Hierarchy
SEC:	Synchronous Equipment Clock
SGC:	Signal Generator Card
SID:	Source IDentifier
SMC:	SONET Minimum Clock
SNMP:	Simple Network Management Protocol
SONET:	Synchronous Optical NETwork
SSM:	Synchronization Status Message
SSU:	Synchronization Supply Unit, also called SASE, BITS or TSG
STU:	Synchronization Traceability Unknown
T1:	An abbreviated form of 1544 kbit/s, also called DS1
TCC-NTP	Time Code Card-Network Time Protocol or TCC-NTP card
TCP/IP:	Transmission Control Protocol/Internet protocol
TDEV:	Time DEViation - Square root of TVAR, expressed in nano seconds.
THC:	Tracking & Holdover Card
TID:	Target Identifier
TS0:	Time Slot 0
TIE:	Time Interval Error - Variation in time delay of a given timing signal with respect to an ideal timing signals over a particular time period. Time interval error over an observation time S (seconds).
Tip & Ring:	Two wires required for a connection (positive & negative)
TL1:	Transaction Language 1
TNC:	Transit Node traCeable
SSU:	Timing Signal Generator, also called BITS, SSU or SASE

TVAR:	Measure of the expected time variation of signal as a function of integration time. See also TDEV.
UI:	Unit Interval
UL:	Underwriter’s Laboratories, Inc
UTC:	Universal Time Coordinated
WAN:	Wide Area Network
Wander:	Long-term non-cumulative variations of the significant instants of a digital signal form their ideal positions in time, expressed in seconds or in UI (unit interval).
WTR:	Wait-To-Restore time function
XO:	Crystal (X-tal) Oscillator
Ym:	Fractional Frequency Deviation - normalised instantaneous offset from a reference, in function of time.

Document History

Project N°	:	5548C
Document Type	:	User Manual
Version	:	English
Author	:	OSA
Revision	:	P
Last Up-date	:	09.10.2013
Creation	:	28.11.2006

REVISION	DATE	CORRECTIONS
--	28.11.2006	- Creation
A	11.12.2006	- Minor page adjustments
B	08.02.2007	- Add support for GPS card
C	15.04.2008	- Add connection description for remote panel SUB-D - Extract GPS Antenna installation information - Extract TL1 commands and alarm lists
D	19.06.2008	- Modify power supply labels - Add GPS cards in shelf figures - Update output section descriptions
E	26.11.2008	- Change procedure for Critical Alarm Testing in the Commissioning chapter - Update OSA USA office address - Update TCC-NTP card description
F	09.04.2009	- Add weights for Management and Remote panels - Update EMC norms - Update NTP card descriptions and ordering numbers
G	18.09.2009	- Add and update all aspects of the TCC- NTP card - Add ordering number for new release SGC card
H	03.07.2010	- Add TCC-NTP card with NTP output on the front panel - Add ethernet speed management setting
I	25.10.2010	- Add note for PPS offset in GPS module - Delete address for OSA USA
J	16.11.2010	- Update serial connection with Terminal Emulator procedure
K	29.09.2011	- Add TCC-PTP card
L	29.11.2011	- Update TCC-PTP drawing and descriptions
M	18.09.2012	- Add GNSS (GLN) Car - Add a warning note for output terminations in section 4.5.2
N	25.10.2012	- Update step 5 in Grounding & Power Connection procedure in section 4.4

REVISION	DATE	CORRECTIONS
O	25.02.2013	- Add supported slaves at 64 Sync/s in TCC-PTP card feature. - Add RS-232 AT-LINK serial cable drawing. - Update overall drawings
P	09.10.2013	- Update TL1 TCC-PTP command (release 1.57) - Add Input Line remark in chapter 6.5.3 - Add TCC-PTP setting - Add Unicast capability

FRONT VIEW DRAWING